

RAILROAD GAZETTE

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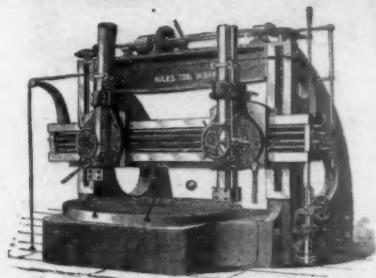
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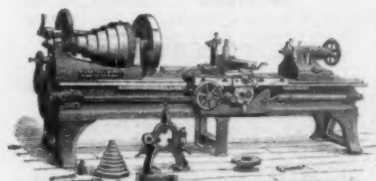
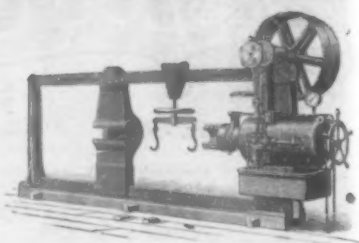
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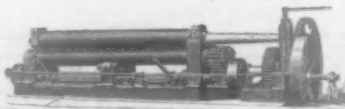


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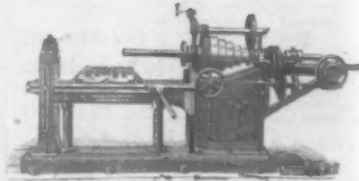
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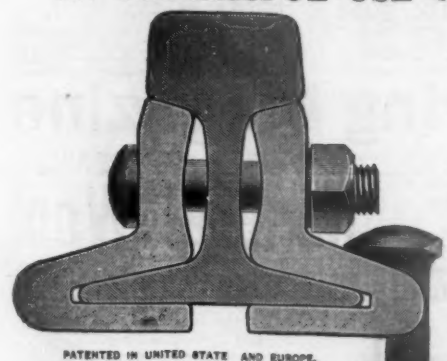
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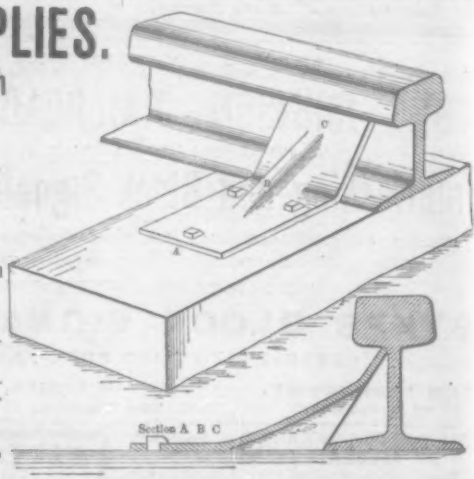
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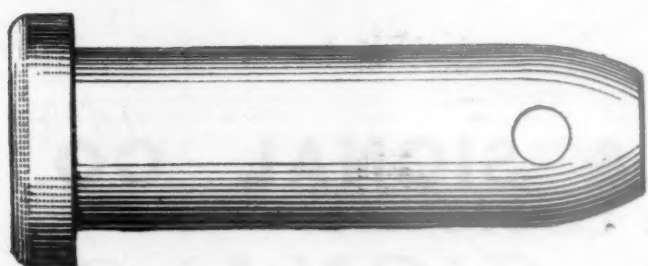
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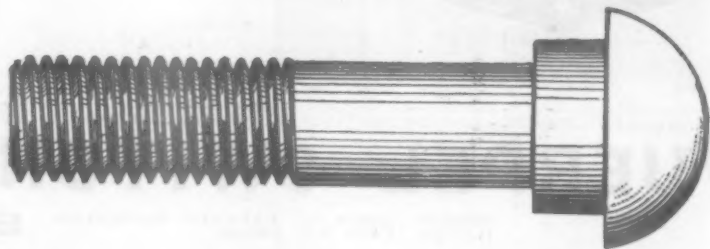
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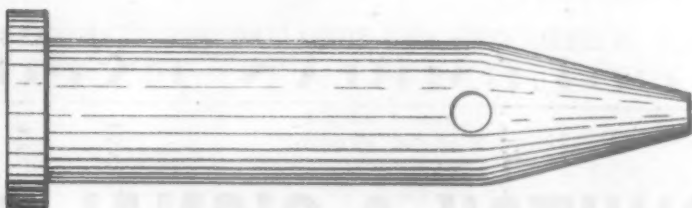
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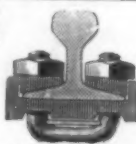


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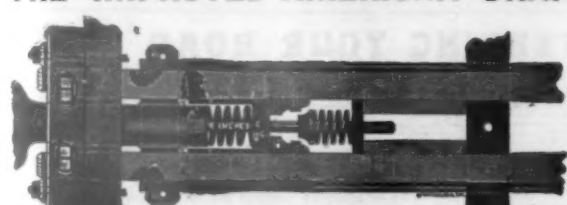
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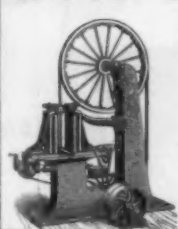
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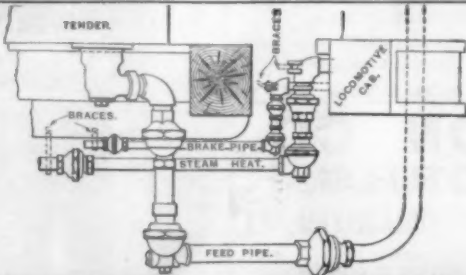
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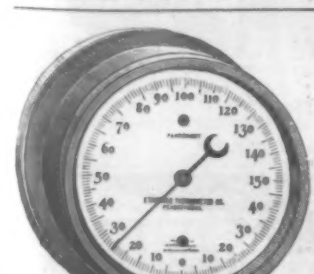
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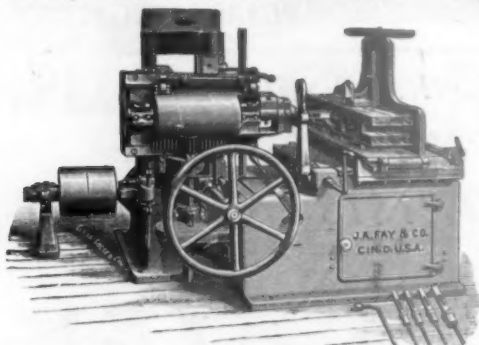
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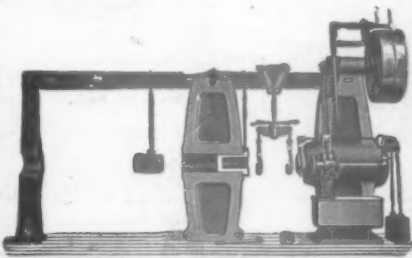
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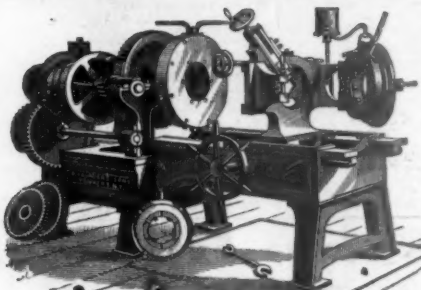
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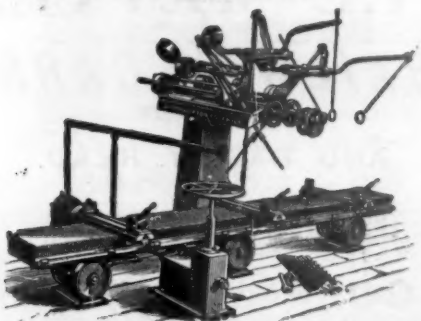
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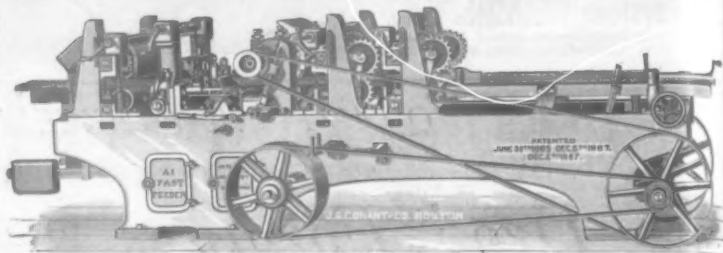
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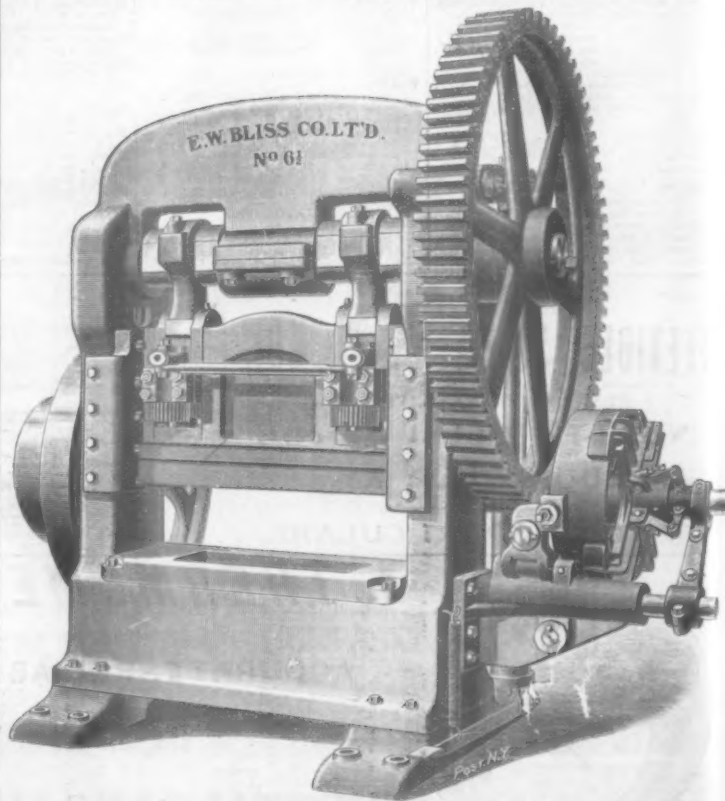
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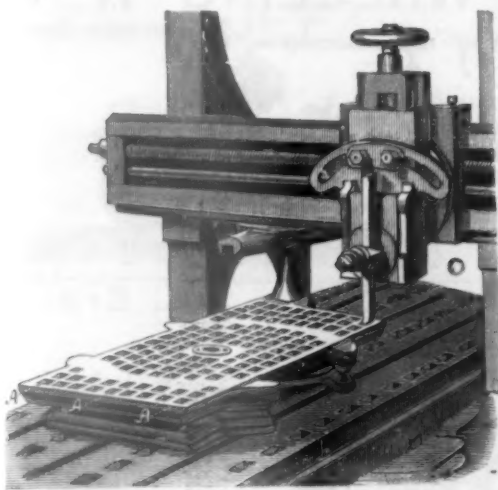
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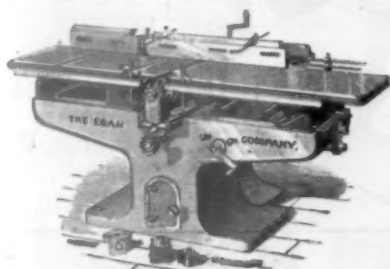
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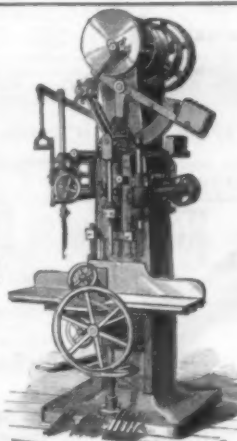
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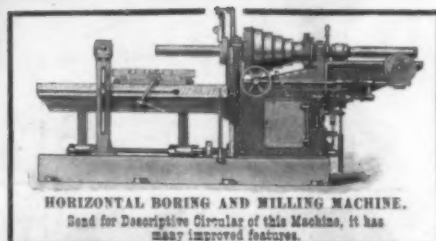
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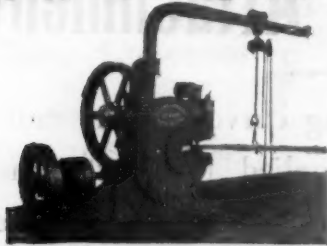
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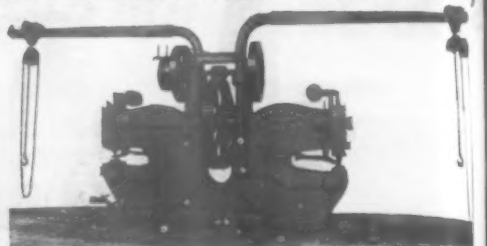
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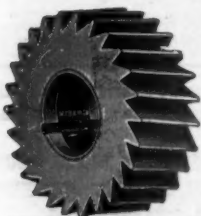
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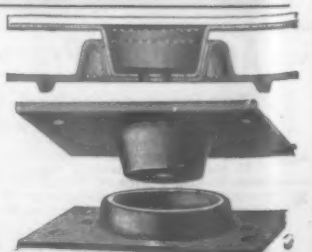
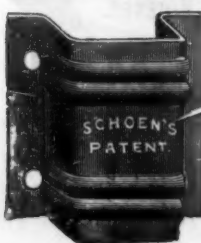
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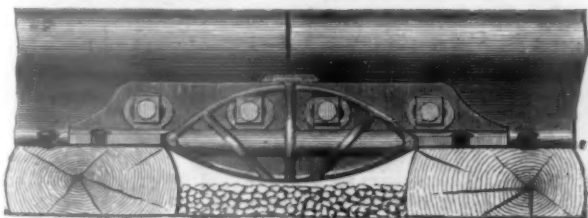
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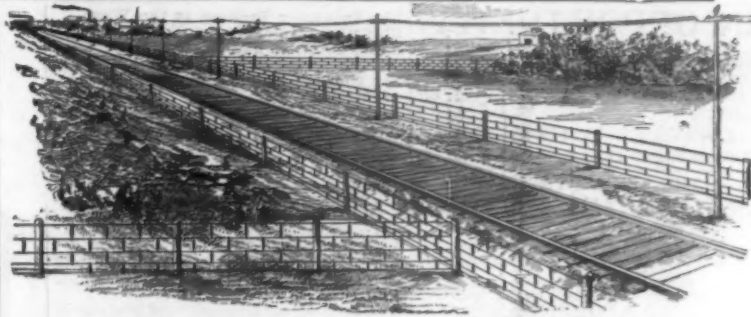


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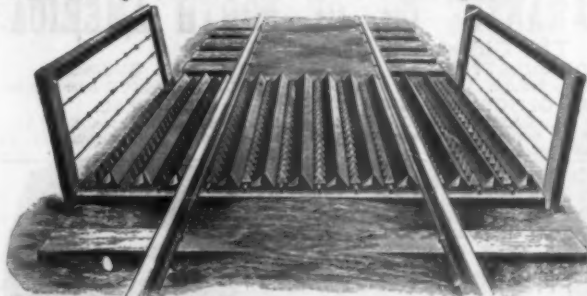
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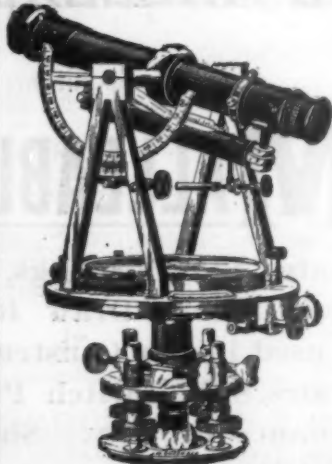
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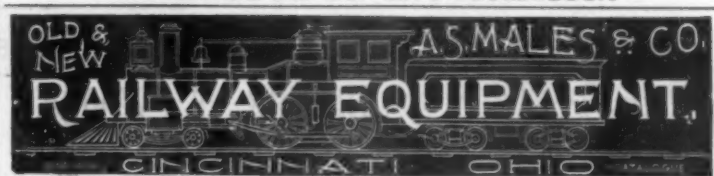
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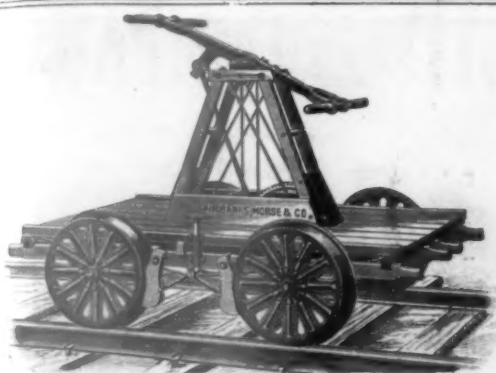
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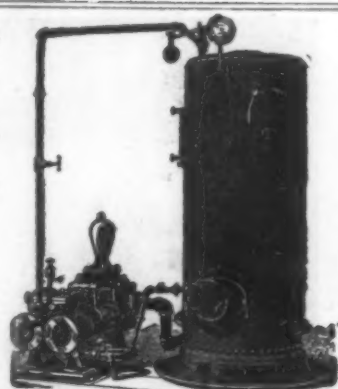


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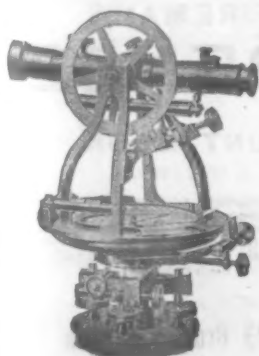
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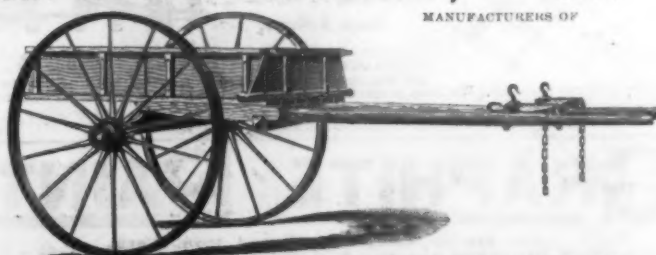
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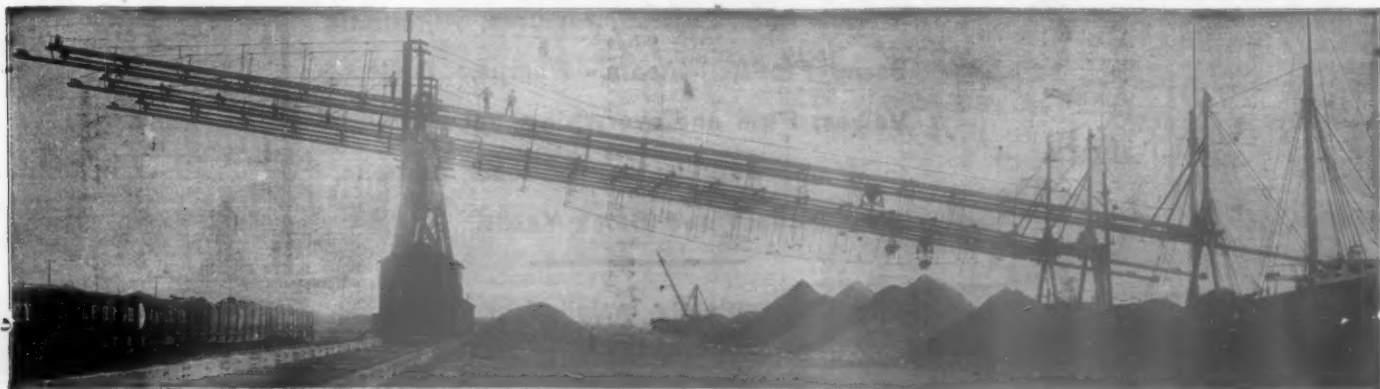
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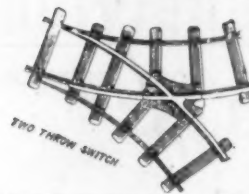
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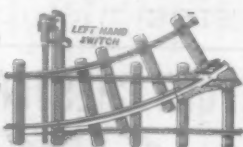
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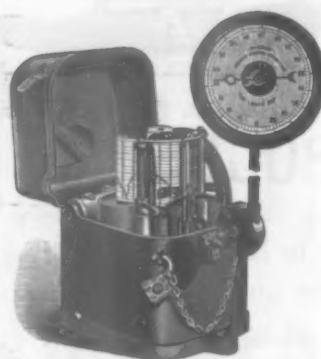
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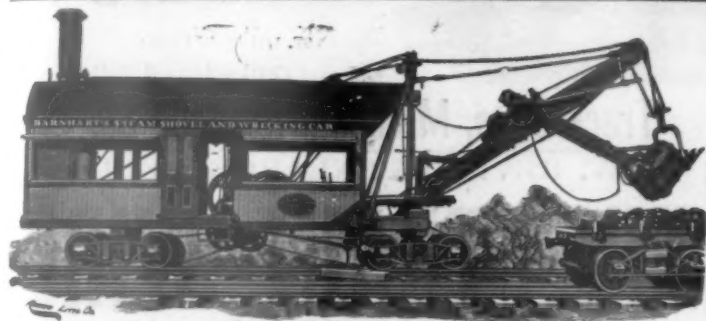
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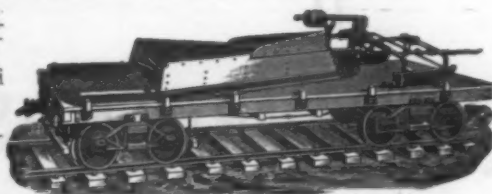
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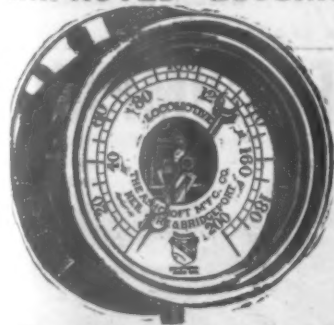
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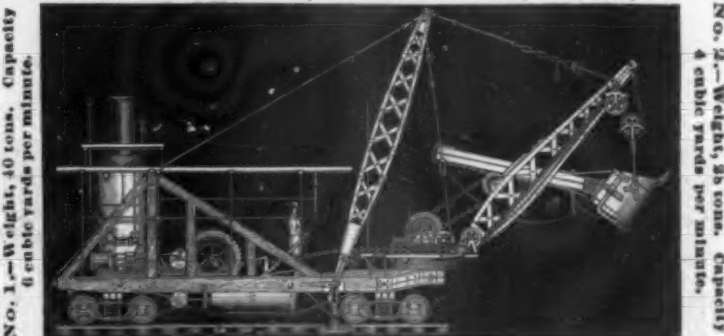
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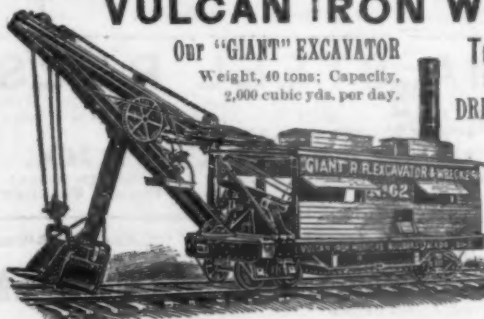
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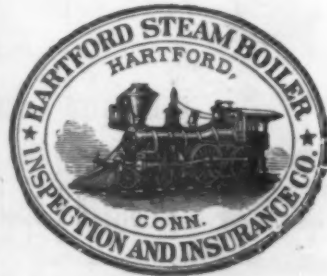
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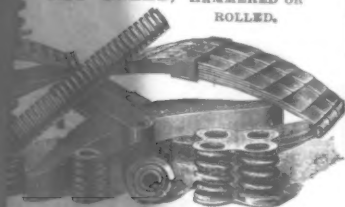
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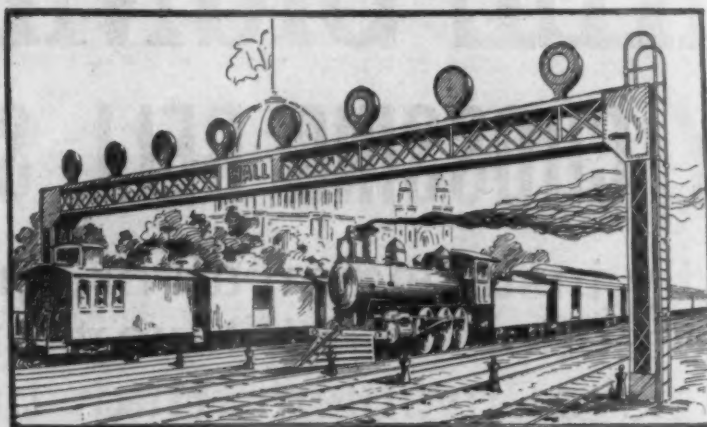
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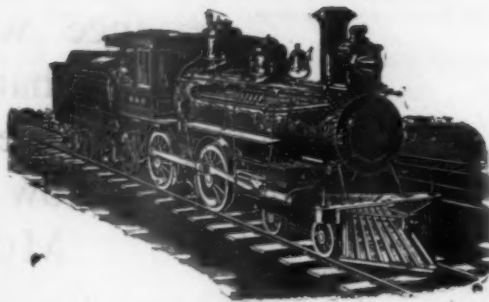
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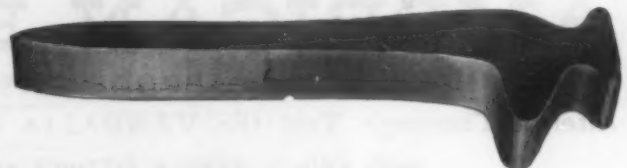
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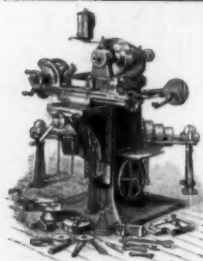
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Contributions.

Coupler Opening Devices.

TO THE EDITOR OF THE RAILROAD GAZETTE:

There appeared in your issue of Oct. 14 a letter signed "W" the writer of which said that it is doubtful if any device without the action of the spring can be made to automatically open the knuckle of an M. C. B. coupler. I think that "W" is mistaken, and I would ask his attention to the Weeks & Bush plan for opening the knuckle. This device has no spring or chain or rod, and yet it cannot fail to open the knuckle when the locking pin is lifted. You have already shown this as applied to a link and pin coupler; it is very simple. On the top of the coupler head, and concentric with the pivot-pin hole, there are two inclined planes. A stud goes through the top of the pivot pin, and there is a little play up and down of the knuckle in the head. When the knuckle is closed the ends of this stud ride up on the inclined planes. When the knuckle is unlocked the weight of the knuckle itself causes the ends of the stud to slide down on the inclined planes, but in doing so the stud and the pivot pin must take a spiral motion which necessarily opens the knuckle. I am sure that this contrivance will "do the automatic act" perfectly, and I have examined all of the automatic couplers of the vertical plane type, and find nothing so simple and so meritorious as this device which was patented by Messrs. Weeks & Bush last September. B. C. A.

Ballasted Bridge Floors on the Richmond, Fredericksburg & Potomac.

RICHMOND, Va., Nov. 22, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The peculiar bridge floor which you speak of as having been seen on this road, grew out of a desire to protect the wooden stringers of trestles or open culverts from fire. I afterwards applied it to plate girder bridges, because it made a satisfactory and cheap floor, easy for flagmen to run over and comparatively noiseless, besides being absolutely secure from the bunching sometimes consequent upon derailment. It consists of sawed ties laid immediately upon the stringers or girders, and separated by boards two or three inches thick, of the width proper to separate these ties from four to eight inches, according to the preference of the engineer (I favor six inches), of the same length as the ties; a similar board is fastened along the end of the cross ties and the trough thus formed is filled with gravel.

I do not pretend that this floor is to be preferred to a metallic floor, if the metal be heavy enough, for I have been in favor of heavy ballasted bridges for a good many years; but I prefer it to the open floor, and our experience goes to show that the supporting wooden stringers are quite as durable, if not more so, under such treatment. E. T. D. MYERS.

Rapid Transit in London.

LONDON, Nov. 13, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I shall always be ready, not to say delighted to accept "a Yankee suggestion or two." I never learned any where else so much about rapid transit in a week as I learned in Chicago from an hour's talk with the late Colonel Goddard, of the "Alley" road. But for all that, you have not convinced me that I am wrong in my ideas as far at least as London is concerned. For us I still think new elevated

roads a practical impossibility. You admit that "it does not seem probable that such a scheme . . . can ever be carried out by private means." In the present temper of English opinion this is as good as saying that it cannot be carried out at all.

I may add that in the original draft of my article there was an account, which reasons of space forced me subsequently to omit, based on Mr. Curtis Clarke's paper, of the proposed new boulevard in New York. That account ended with these words: "Some day, perhaps, when we in England have learnt that the whole duty of a municipality does not consist in blinding upon the backs of promoters burdens too grievous to be borne, some such scheme may be worth discussing in London. But the time is not yet."

Another point; I venture to suggest to you that the real cause of the financial success of the Manhattan and the financial failure of our Metropolitan district is that your minimum fare is five cents, while ours is (and must be owing to omnibus competition) two cents. A railway costing three to four million dollars per mile cannot live on two cent fares; consequently it is forced to cultivate semi-long-distance traffic. To do this means keeping stations a good distance apart, which again reduces the attraction to short distance passengers.

THE WRITER OF THE *Quarterly Review* ARTICLE.

Some Reasons Why Elevated Roads Are a Necessity to Philadelphia.

BY C. W. BUCHHOLZ, C.E.

President of the Quaker City Elevated Railroad.

There is probably not a city in the United States of its size and population, of its commercial and manufacturing importance and of its wealth and enterprise, where the methods of rapid transit between its various sections and suburbs are at once so elaborate and so ill-advised as in Philadelphia to-day, or as slow and uncertain; and yet, a generation ago, the steam railroads and the tramway service of this city were looked up to as models, not only by the growing cities of the West, but by the Metropolis itself. Philadelphia then had six independent steam railroads bringing travelers from the adjoining states and the rural districts of Pennsylvania to its borders. Of these six companies the Germantown & Norristown, one of the oldest railroad corporations of the state, operated the only line that could, strictly speaking, be called suburban. . . . The best of street car service then known anywhere connected all the stations of the steam railroads with each other and with the resident and business part of the city and was entirely satisfactory to the people.

If these conditions as existing some 25 years ago could have been fully recognized as only temporary, and if a plan had then been elaborated by the municipality and by all the railroad companies interested, to provide terminal facilities for the railroads and rapid transit through the city and to these termini, nobody would have dreamed of suggesting the incongruous and expensive systems as they now exist and are in the course of construction, evolved as they were, out of rivalry and monopoly and without regard to the true interests of the city.

When the United railroads of New Jersey were leased by the Pennsylvania Railroad Co., and when the connecting railroads were completed, a rivalry was born between the two largest railroad companies of this city for which there was no public cause and from which the people received no benefit, since the geographical and commercial situation of the two roads, as they then existed, were not competitive; the one being a trunk line rapidly extending its lines to the West, and the other being a local coal road busy building branches in the interior of the state to develop the anthracite coal fields. Nevertheless, the policy of both companies was suddenly changed, and in the absence of any real cause for enmity an excuse was created; the suburban passenger traffic was seized upon as a pretext, and that pretext was carried to such an extent that vast sums of money have been spent and are still being spent, not only to secure and accommodate strictly suburban passengers living in adjoining villages, but actually to compete with street cars for the purely local trade.

It goes without saying that such a policy cannot be carried on with success indefinitely; it is neither profitable to the companies nor satisfactory to the public. The handsome station of the Pennsylvania Railroad on Broad and Market streets was only opened for traffic ten years ago, and yet to-day it is hardly large enough to accommodate one-half of the traffic. Large additions are now being made to the depot itself and to the tracks leading to it, but in less than ten years from now the congested condition of to-day will be repeated, and where is the remedy to be found then?

Yet, in spite of this object lesson, the Reading is repeating the mistake of its great rival, and is concentrating all its lines into a *cul de sac*. The magnificent structure on Twelfth and Market streets, now nearly completed, will be a burden to the company five years from now, and year after year, as millions after millions must be spent to enlarge and keep up this expensive terminus, it will at last be recognized that it is [not] the function of a large transportation company, embracing in its magnitude half a continent, to carry passengers over costly viaducts to still more costly termini for a fare of five cents from one street to another within the city limits.

When that period has arrived, and the time is not far distant, the present handsome termini of the Pennsylvania and of the Philadelphia & Reading railroads will be used only for local traffic beyond the city limits, and they will be commodious enough to accommodate this with credit and profit to the company and with comfort to the patrons of the road for many years to come. But all the through trains of both these rival lines should then never come to Market street, since the two companies can readily avoid the expense and delay of going into and out of a head house terminal station by taking advantage of and improving the numerous lines they own in the city of Philadelphia. The Pennsylvania Co. has a continuous railroad from Gray's Ferry and City avenue to Frankford, and it should have its central passenger station at the common junction of all its main lines at Mantua.

The Philadelphia & Reading Railroad, in connection with the Schuylkill River East Side Railroad, cuts through the city from north to south, and by constructing an eastward connection of the latter road with its main line on Pennsylvania avenue, it could run all its through traffic without reversing the trains continuously through the city and accommodate every patron of the road by two or three stops within its limits.

To meet these altered conditions, as outlined above, and to meet the constant growth and development of the city, some method of rapid transit must be devised that will aid and invite improvements, instead of retarding them. Large investments in real estate and many years of custom have permanently determined in Philadelphia, as well as in other large cities, the financial and business centre within certain limits. . . . Modern civilization, while it drives the people in great numbers to earn their living in large cities, nevertheless dictates that men should not sleep where they work, and every one will therefore select his home according to his means, wherever transportation is the most convenient and rapid.

In order to accommodate these habits of city life, three distinct systems of transportation are absolutely necessary, and should be co-operative with each other: The great trunk railroads to bring the occasional traveler from the country at large, and the regular commuter from the suburbs; a system of railroads above or below the surface of the street to carry the people rapidly from one remote ward of the city to another; street surface railroads to convey passengers with comfort and speed from block to block. As to the first system here enumerated, it is but fair to say that there is, perhaps, no city in the Union so well and ably served as Philadelphia. Of the second system suggested, it is equally true to say that this city has absolutely nothing like it; and as to the third, the existing service is altogether too notorious in its shortcomings to be here commented upon. To supply this urgent need of rapid transit, and thereby incidentally improve the accommodations of the street-car passenger railways, is the object of the construction of the Quaker City and Northeastern Elevated railroads and their branches.

Experience has demonstrated beyond all doubt, that elevated railroads, properly constructed, upon public streets, form the only system of rapid transit in populous cities that can be operated with satisfaction to the people, with profit to the investor, and without serious injury to private property. Such railroads do not necessarily exclude light and air from, or interfere with access to, the abutting houses of the streets occupied by them; the noise of a passing train is not so loud as that of a team or carriage passing over the pavement; the annoyance caused by smoke and soot emitted from a locomotive has been reduced to a minimum, and the electric motor, the power of the near future, will soon eliminate that evil altogether.

The Juniata Shops.

We suppose that the Juniata shops of the Pennsylvania Railroad are the finest locomotive shops in the world, but as they have been described quite fully in the *Railroad Gazette*, we shall make no general description now.

They are at present fully equipped, having 840 men employed, and are turning out an average of three locomotives a week. The estimated capacity of these shops is 150 engines a year. Most of the engines built up to the present time have been the class "R" consolidation of the P. R. R., but at present a number of six wheel switching engines of the class "M" type are being built.

Outside and in, these shops are remarkably neat and orderly in appearance. Everything is done with great system, and there are no odds and ends left lying around the yards or in the shop corners. Even the wash rooms provided for the men are neat enough for a first-class hotel.

The machine tools in these shops are of the most modern design, and the work is almost entirely done by the piece; under this system the men are enabled to make good wages at a low cost of output to the company. It is remarkable to the close observer what a large amount of work is turned out of these shops, when their size and total floor space is taken into consideration.

In the boiler house the Roney mechanical stoker is employed for firing and the ashes are conveyed away through a tunnel underneath the furnaces and thence

into a car; there is no shoveling done except that necessary to cause the coal to run from the cars into the crusher.

In the electric and hydraulic building are concentrated the engines, compressors and dynamos, which furnish the hydraulic, pneumatic and electric power used in this plant. From this building the air pressure is also provided for operating the switches in the eastbound classification yard some distance away. In the shops air pressure is used for operating the heating furnaces, which are the regenerative type of gas furnaces. The air is used at these furnaces for raising and lowering the doors and operating the air and gas valves necessary for the reversing of this style of furnace.

Hydraulic power is extensively used for cranes, and the great variety of tools in use in the boiler shop, and at other points in the shops. In the boiler shop all of the shears and riveters are hydraulic as are also the flanging machines for flanging various parts of boilers and tanks. A rivetter may be seen here with sufficient opening to rivet the entire length of the boiler, and there is one punch with a capacity for punching 70 holes at one stroke. This latter is used on tank work. Aside from the traveling and jib cranes in the boiler shop most of the tools are provided with small cranes attached directly to them. These cranes have roller bearings and are very sensitive, enabling the work to be handled with great ease and accuracy. There are several electric cranes in the shops and electricity is used for other minor purposes as well as for lighting.

All of the material for locomotives, not only the machine parts but the various parts of the boiler are made to standard templets and gauges, so that all parts of any one class of locomotive are absolutely interchangeable.

Each shop is provided with the Sturtevant heat system, and the blacksmith shop has forced ventilation by the same system and is practically free from smoke and gas.

Lubricating Car Axles on German Railroads.*

BY PROF. J. E. DENTON.

At the request of the writer, Mr. F. T. Gause (during his location of some weeks in Hamburg, in connection with lubricating oil experiments for the Standard Oil Co.), made the following notes regarding the most improved methods of lubricating car axles on German railroads.

The fresh lubricating oil is fed to a reservoir at the top of the box, fig. 1, and reaches the journal by wick syphon. A pad, fig. 2, is pressed against the lower surface of the jour-

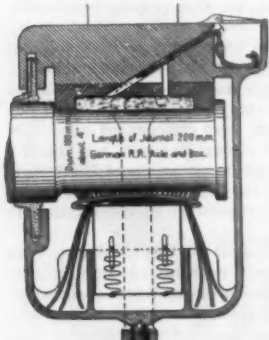


Fig. 1.

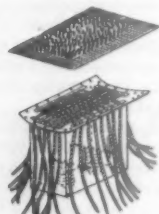


Fig. 2.

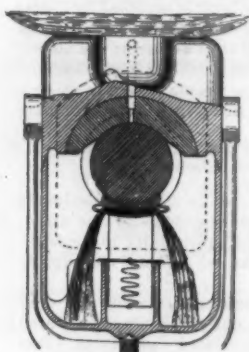


Fig. 4.

German Axle Box and Oiling Pad.



Fig. 3.

and 4. A felt ring, fig. 3, fits snugly in an annular groove in the box, and is made to hug the axle closely by means of two light brass spiral springs. This prevents the escape of oil from the entrance of dust to the box.

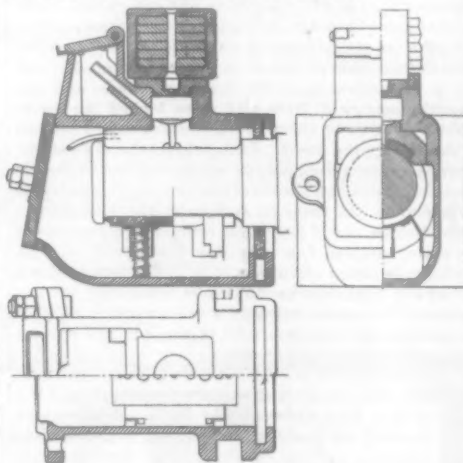
The speed of passenger trains ranges from 56 English miles an hour for passenger service to 28 miles for freight service. The number of axles per passenger car varies from two to four.

Passenger trains of six cars, running 176 miles, between Hamburg and Berlin, averaging a total of 15 axles, use one-fourth of a pint of oil per axle per 100 miles. The pressure per square inch of projected area of bearings averages about 325 lbs., and the rubbing velocity about 400 ft. per minute. The pressure per square inch, rubbing speed, and the quality of lubricating oil, are practically the same as are common to American passenger traffic in which the oil is applied by saturating a loose mass of

woolen or cotton waste, and a dust guard is used consisting of a disc of leather or wood.

The average consumption of oil in American practice is given by Hall's "Car Lubrication" as two-fifths of a pint per axle per 100 miles. The writer has noted, however, that first-class American passenger service consumes one pint per axle per 100 miles. A much lower rate of oil consumption has been reported for the European "pad feed" box than is given by Mr. Gause. For example, Wellington, in his "Economic Theory of Railway Location," quotes a consumption of one-seventieth of a pint per axle per 100 miles. Such results do not, however, represent the average consumption, but rather possibilities, when special care is used to limit the consumption by following a car for a test, with bearings in the best condition. Under such conditions the use of woolen waste has permitted the consumption to be as low as one-tenth of a pint per axle per 100 miles. There is no doubt that the use of a "pad" instead of waste, and of a more elaborate dust guard, may reduce the average consumption to one-fourth that common with waste, but the greater care necessary to maintain springs and syphons, in good working order, has thus far made the use of waste preferable in American practice.

Somewhat more complete illustrations of an axle box almost identical with the one described by Professor Denton, were shown in the *Railroad Gazette* Dec. 4, 1885. The one there shown was standard on the Saxon State railroads. The writer of the article published then, who had been a year and a half in Germany and made frequent and long railroad journeys, and talked much with officers of the various railroad systems, said that a hot box was almost unknown there.



Swedish Axle Box.

A somewhat similar arrangement is shown in the engravings of the standard axle box of the State Railroad of Sweden reproduced from a recent issue of the *Revue Générale*. It will be seen that the oil for lubrication flows down from a receptacle above, as in the German box, and is raised from below by wicking and is distributed by a pad. The front of the box is easily taken off for examination and for replacing the brass and the oiling pad. It is only necessary to raise the vehicle an inch to get out a brass. The article from which the engraving is reproduced gives no further description of this axle box.

The American Society of Mechanical Engineers.

The annual meeting of The American Society of Mechanical Engineers began at the house of the Society 12 West Thirty-first street, New York City, on Tuesday evening, Nov. 29. A large number of members were present at this introductory session, auguring well for the success of the several days to follow.

The feature of the Tuesday evening session was the address delivered by President Charles H. Loring, and which was devoted to "The Steam Engine in Modern Civilization." The address was admirably written and delivered. A few extracts follow.

The great historian who looks back a century hence upon the present era, . . . will point out that the great underlying cause of the wonderful progress made by mankind during the last hundred years was the steam-engine. . . . The steam-engine, with all its simplicity, is, what no other machine ever was, the creator of physical power, and this to so enormous an extent, at so small a cost, in so portable a form, and with such convenience of application, that it speedily revolutionized the economy of labor, and in so doing necessarily revolutionized all the conditions of man.

Contemporaneous historians have but scantily drawn attention to the immense influence exerted upon modern history by the steam engine. They follow in the same well-worn ruts, giving dubious descriptions of battles, names of monarchs and of statesmen, lists of decrees and laws, no end of political negotiations and intrigues, and the whole array of puppets who seem to push the car of time, while they are only flies upon its wheels. The real shaping cause of the march of modern events and of the great industrial progress of the times has but trivial recognition in the literature which pretends to account for what has happened, or to predict what may ensue.

One of the peculiarities of the genesis of the steam engine is, that it seems to have been more in the nature of a creation than of an evolution; for it was carried by its inventor, both as regards principles and practice, to a wonderful state of completeness. Very little has been added by his successors to his mechanical details or his

various combinations of them. The invention seems to have nearly realized the birth of Pallas. The only modification in which he was not concerned is that of using the same steam in successive cylinders of increasing capacities, thus forming what may be termed, for the sake of distinction, the multiple cylinder engine as opposed to the single cylinder engine. The original multiple cylinder engine of Horublower, brought out in 1781, and since known as the compound engine, and, by extension of the principle, as the triple expansion engine and the quadruple expansion engine, had thus a beginning almost coeval with the single cylinder engine of Watt. After much litigation it was declared to be an infringement on Watt's patents covering the use of steam expansively, and it passed out of use. It did not, in fact, give any economic gain over the single cylinder engine, as the pressure of the steam was the same in both and only a few pounds above the atmospheric pressure, limiting the measure of expansion for maximum economy to about one and a half times. . . . The multiple cylinder engine of the triple expansion kind produces the horse-power with about two-thirds the coal that the single cylinder engine does. . . . If the original steam engine was the greatest boon mankind has ever received, an increase of its value by one-third over its best development should add proportionately to the beneficence; and such is the industrial effect of the modern steam engine in its most advanced stage.

Following as a natural sequence this recital of the potent influence of the steam engine upon man's social and physical conditions comes the question, Is it to continue as the great power producing machine of the future? Can the inventive mind of man and his artful hand bring into being any other device as a substitute for it that will do its work cheaper, better and more handily? To give answer to this is to say how it can be done, and as yet none is ready with a reply. Without doubt there are still "more things in heaven and earth than are dreamed of in our philosophy," but in the contemplation of a solution of this question that already dreamed of is the limitation of our resource. Already we are beginning to avail ourselves of the enormous energy of water power, now going to waste, through the convenience of electrical transmission and distribution, and the hand of the "Wizard" has drawn faint electrical energies direct from the combustion of fuel. The winds and the tides and the rays of the sun have locked up within themselves enormous stores of power, waiting, perhaps, for the ingenuity of man to unbind and convert them to his uses. But, when all shall have been realized which these as yet unused resources offer to man—when all man's present knowledge shall have ended in fruition—the steam-engine, from its portableness, its convenience of application and its self-containedness, will still remain man's valued servant—the grandest conception of the human mind, the great conservator of the human race.

At the close of Commodore Loring's address Mr. J. F. Holloway extended to the visiting members the privileges of the Engineers' Club, and incidentally briefly outlined the aims of that institution. The remainder of the evening was given up to a collation.

WEDNESDAY.

The morning session began with routine business, the first in order being the annual report of the Council. Among other things to which attention was directed in this was the proposition made by the World's Congress Auxiliary that the Society of Mechanical Engineers should undertake the responsibility for the management of the details of the Mechanical Engineering section of that congress. This proposition has been accepted by the Society, and the Council, therefore, urged upon the members the importance of co-operating in making this department of the undertaking a notable success, particularly as the Council has further directed in carrying out the intent of this proposition, that the regular meeting falling in the Spring of 1893 should be moved forward to coincide with the date of the Congress which thus becomes the twenty-seventh meeting of the Society.

A proposition was received also that American engineers be requested to co-operate in erecting a monument at Colmar, Alsace, to G. A. Hirn, deceased, honorary member of the Society.

The matter has been under advisement of providing in 1893 for suitable courtesies to the visiting engineers from Europe. The Mechanical Engineers will arrange for a special effort of its own to tender in its houses all possible service to foreign visitors by having in attendance persons speaking the languages of Europe, and able to give information. A special committee will be appointed for this purpose.

A committee was appointed to consider what special return of courtesies it might be possible to show to the representatives of English and French engineering societies. This committee has formulated an invitation to these societies, the details of which will be announced later.

The Council reported a total present membership of 1,500. The Finance Committee reported expenditures during the year amounting to \$34,195.00, leaving a balance on Nov. 1, 1892, of \$1,628.44, an appreciable improvement over the figures for the preceding year. Several other committee reports were presented. The election of officers of the Society resulted as follows:

President, E. B. Cox, Drifton, Pa.; Vice-Presidents, C. W. Hunt, New York; T. R. Pickering, Portland, Conn.; Edwin Reynolds, Milwaukee, Wis.; Treasurer, Wm. H. Wiley, New York; Managers, Chas. H. Manning, Manchester, N. H.; John Thomson, New York; C. W. Persey, Wilmington, Del.

Secretary Hutton presented a number of letters from different quarters bearing upon the subject of sheet metal gauges, a new gauge list being proposed in and submitted with one of these letters. This proposed list was the subject of much adverse criticism, the upshot being the presentation of a motion that the Society recommend a revision of standard gauges for all wire

* From the *Stevens Indicator*.

and sheet metal, and that the thickness shall be denominated by thousandths of an inch, and the numbers of gauges to be the said numbers of thousandths. It was further moved that a committee be appointed to confer on this subject with representatives of other societies and submit a report.

The first regular paper presented was on "An Interesting Boiler Explosion," by F. H. Daniels. A long dis-

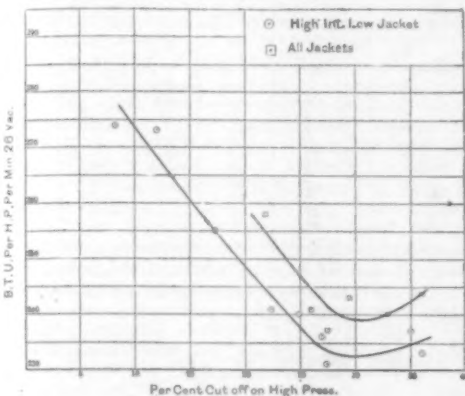


Fig. 1.

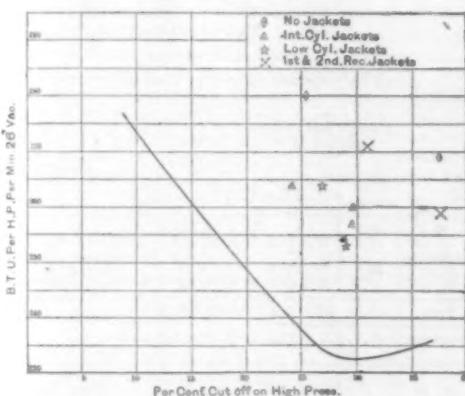


Fig. 2.

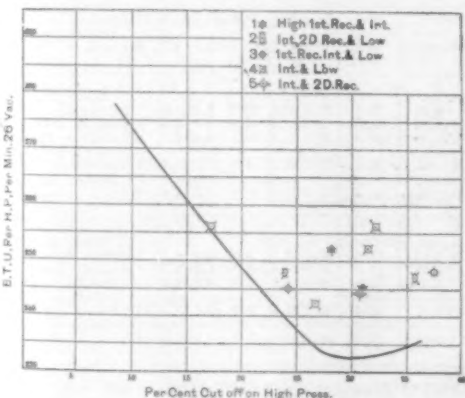


Fig. 3.

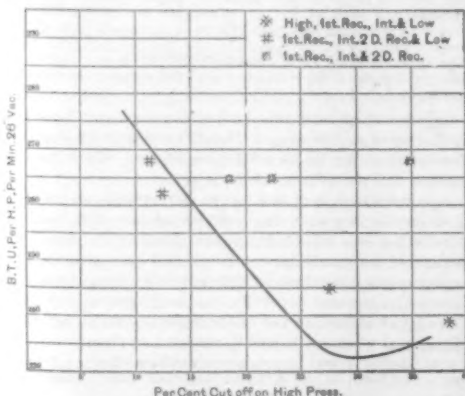


Fig. 4.

ussion followed this paper, many members participating. The chief points brought out in this discussion were the influence of oil and dirt mixtures, imperfect water circulation, and defective material in bringing about bagging of boiler sheets exposed to furnace heat, and the importance of inspection of the material used in boiler construction. The discussion took up the whole remaining time of the session, which was adjourned at 1:30 p. m.

A lunch was prepared in the house of the Secretary, and the remainder of the afternoon was designed to be taken up by excursions to various points of interest,

Voltage = 500.

Operation.	Test of June 8, 1892.		Test of October 8, 1892.		Load.	Maximum Amperage observed in starting.		Theoretical H. P.	Efficiency.
	Amperes	E. H. P.	Amperes	E. H. P.		June	Oct.		
Motor and clutch gears	5	3.35	5	3.35	No load	..	..	..	..
Square shaft for main hoist	9	6.03	7	4.89		..	..	..	..
Square shaft for bridge and trolley travel	10	6.70	7	4.89		..	..	..	..
Both square shafts	16	10.72	13	8.81		..	..	..	..
Bridge travel	15	10.05	15	10.05	No load	..	..	..	..
Trolley travel	24	16.08	25	16.75		..	..	..	..
Main hoist	15	10.05	12	8.01		..	..	..	..
"	23	15.41	22	14.74		..	..	..	..
"	15	10.05	15	10.05	No load	..	..	..	..
"	10	6.70	5	3.35		..	..	..	..
"	15	10.05	15	10.05		..	..	..	..
"	14	9.38	10	6.70		..	..	..	..
Auxiliary hoist	29	19.43	32	21.44	No load	..	..	..	..
"	12	8.04	7	4.89		..	..	..	..
"	13	8.81	13	8.81		..	..	..	..
"	11	7.37	10	6.70		..	..	..	..
Bridge travel	29	19.43	22	14.74	No load	..	..	..	..
Trolley	16	10.72	17	11.41		..	..	..	..
Bridge	21	14.07	20	13.40		..	..	..	..
Trolley	30	20.10	30	20.10		..	..	..	..
Bridge	27	18.90	28	18.76	No load	..	..	..	..
Trolley	21	14.07	20	13.40		..	..	..	..
Main hoist	54	33.18	60	40.20		..	..	..	..
Bridge travel	39	20.10	39	20.10		..	..	..	..
Trolley	20	13.40	17	11.39	No load	..	..	..	..
Bridge	32	21.44	30	20.10		..	..	..	..
Trolley	15	10.05	15	10.05		..	..	..	..
Main hoist	30	20.10	25	16.75		..	..	..	..
"	30	20.10	32	21.44	No load	..	..	..	..
"	4	2.68	2	1.34		..	..	..	..
"	53	33.51	53	33.51		..	..	..	..
"	0	0	0	0		..	..	..	..
Bridge travel	70	46.90	75	50.25	No load	..	..	..	..
Trolley	22	14.74	20	13.40		..	..	..	..
Bridge	30	20.10	30	20.10		..	..	..	..
Trolley	17	11.39	15	10.05		..	..	..	..
Main hoist	38	25.46	37	24.79	No load	..	..	..	..
"	0	0	0	0		..	..	..	..
"	65	43.55	70	46.92		..	..	..	..
"	0	0	0	0		..	..	..	..
Bridge travel	120	80.40	120	80.40	No load	..	..	..	..
Trolley	30	13.40	22	14.74		..	..	..	..
Bridge	40	26.80	45	30.15		..	..	..	..
Trolley	20	13.40	22	14.74		..	..	..	..
Main hoist	45	30.15	40	26.80	No load	..	..	..	..
"	80	53.60	75	50.25		..	..	..	..
"	0	0	0	0		..	..	..	..
Auxiliary hoist	37	24.79	35	23.45		..	..	..	..
"	47	31.49	45	30.15		..	..	..	..

the members being left to go either singly or in parties. Among the objective points were the:

Morgan & Quintard Iron Works; North River Iron Works; Pond Machine Tool Works; Stevens Institute of Technology; Columbia College, School of Arts, Law, Mines; Columbia College, School of Medicine (College of Physicians and Surgeons); Pratt Institute; Washington Bridge; Shipyard and Works Samuel L. Moore & Sons Co.; World Building; Equitable Building; Metropolitan Museum of Art; Museum of Natural History; New York Oxygen Co.; Ball & Wood Engine Co.; Harper Bros. Power House, 125th Street Cable Road; The Hammond Type-Writer Co.; Somers Bros. Tin Plate Works; Railway Ammonia Motor Co. and Fair of the American Institute.

The larger number of members, however, preferred to spend the afternoon in smoke and talk at the Society's house, reserving the excursion for Thursday and Friday afternoons.

On Wednesday evening a reception was held at Sherry's at Fifth Avenue and Thirty-seventh Street, this being the principal social feature of the week's programme.

PAPERS PRESENTED AT THE MECHANICAL ENGINEERS' MEETING.

One of the most valuable papers presented at the annual meeting was that by Prof. C. H. Peabody and Mr. E. F. Miller on "Tests of the Triple Engine" at the Massachusetts Institute of Technology.

Tests of a Triple Expansion Engine.

The tests described were part of the regular work in the steam engineering laboratory at the Massachusetts Institute of Technology during the school of 1891-2. This engine has been previously described, and it will be remembered that it has provision for jacketing the cylinders and the receivers, and is fitted with the necessary pipes, etc., for running in various combinations. In the present tests it was running in the usual way for a triple engine, the cranks following at 120 deg. in the order of high, intermediate and low pressure. The priming in the steam for the throttle valve was 1.1 per cent. for all of the tests. The steam in the jackets was at boiler pressure. The steam condensed in the condenser was collected and weighed in tanks. The drain from the several jackets was caught and measured in a graduated receiver. All the tests were one hour in duration. The surface condenser into which the engine exhausts is used for a variety of laboratory work, and, on account of the various connections, it was found impossible to maintain a more satisfactory vacuum. In the table accompanying this paper, the British thermal units per horse power per minute are calculated on the assumption that the vacuum was always 28 in. of mercury, and that the mean effective pressure for the low pressure cylinder was increased or diminished by the difference between the actual and the assumed pressure in the condenser. The first nine tests were made with steam supplied to the jackets on the three cylinders of the engine, but not to the receiver jackets. This series is the most complete and the best economy. The results of the tests are plotted in Fig. 1, with the per cent. of cut-off on the high pressure cylinder for abscissa and with the British thermal units per horse power per minute for ordinates. The curve shows that the best performance of the engine is attained with a cut-off on the high pressure cylinder at thirty per cent. of the stroke. The cut-off on the intermediate and low pressure cylinders for all of the tests reported was set to give an expansion in the low pressure and intermediate cylinders down to, or nearly to, the back pressure lines for those cylinders. The next six tests were made with steam in the jackets on all the cylinders and in the jackets on the intermediate

receivers. The results are plotted in Fig. 1 by the upper curve. The most important conclusions arrived at from the comparison of this group of tests, with the first group, is that the application of heat in the jackets was carried to an excess. The next nine tests, the results of which are shown in Fig. 2, in connection with the principal curve of Fig. 1, which is reproduced for comparison, were intended to show the action in the individual jackets. It appears that it does not make much difference in the economy whether the steam jacket, if only one is used, be placed on the intermediate or the low pressure cylinders.

The main interest of the fourth group of tests, which are plotted in Fig. 2, together with the curve representing the first group, is to see whether a jacket should be applied to the cylinders and receiver when the steam contained is at high pressure, or when the steam contained is at low pressure. They appear to show that it makes little difference which system is used.

The last group of tests is made up of a miscellaneous lot of tests made somewhat at random. These are plotted in Fig. 4 and appear to show, in connection with the tests of the fourth group, that the jacketing of the three cylinders without jacketing receivers gives best result.

Through it is too early to announce any definite general conclusion from this series of tests, we have gathered a general idea that it makes but little difference where steam-jackets are used on an engine, provided the jacketing is carried far enough and not too far.

Another interesting paper is that by Mr. Anthony Victorin, giving an account of two tests of a large overhead traveling electric crane at the Watervliet Arsenal, West Troy, N. Y.

Performance of an Overhead Traveling Crane Operated by an Electric Motor.

The crane tested has a span of 60 ft., a clear hoist of 40 ft. and a capacity of 120 gross tons. The capacity of the auxiliary hoist is 10 tons, hoist 56 ft. The total weight of the whole crane is about 150 tons. The bridge rests on eight double-flanged wheels (four on each side) of 36 in. diameter, the trolley on 16 wheels of 24 in. diameter. All wheels are arranged in pairs in compensating beams to avoid inconvenient results from want of uniformity in the level of the track rails. All wheels have also anti-friction steel roller bearings.

The crane is operated by a single (flat-field) electric motor. The electric current is generated by a Thomson-Houston 55 H. P. dynamo. Its voltage is 500, the speed 1,000 revolutions per minute.

The trolley is provided with two grooved chain drums, each being capable of winding 250 ft. of 1 1/4-in. wrought iron main hoisting chain. These chain drums revolve loose on trolley axle shafts 7 in. in diameter, with bronze bushed bearings of 24 in. length at each end of drums. The lower chain-sheave block contains six bronze-bushed sheaves of 30 in. diameter, while the upper block contains five sheaves of 33 in. diameter, each of which swivels independently of the others. The chain is rove twelve times through the sheaves. The chain drum of the auxiliary hoist is located above one of the main chain drums, and is grooved for a 3/4-in. chain of sufficient length for 56 ft. hoist. The operating cage contains all manipulating levers, also the main switch, rheostat, etc. All motions of the crane can be in operation simultaneously. All gears of the crane mechanism are carefully cut, except the gears on the chain drums, which are cast; all bearings have bronze bushings. All working surfaces are finished smoothly and all parts are carefully adjusted.

But notwithstanding all possible care with respect to the construction and the arrangement of the crane mechanism, a great percentage of the driving power is absorbed by friction, and the maximum efficiency of the main hoist is only about 40 per cent., the lowest efficiency is about 20 per cent.

The following table contains a complete statement of the two tests, one made in June when the crane was first erected, and the other in October after four months service.

A short paper containing considerable information of practical value is the following by Mr. W. S. Rogers:

To What Extent Can the Milling Machine Be Used to Replace the Planer?

It is a matter of no small moment to every practical, progressive shop director having the responsibility of the semi-annual dividends thrust upon his shoulders, to determine just what type of machines to select which will be best adapted to his special line of work.

For example, if the work has always been done on planers, and they are peculiarly adapted to it, would it be advisable to replace the old ones with new ones with latest improvements and added strength? If so, what will be the percentage of gain in time over those now in use? Or shall a milling-machine be the tool to be placed on trial to shorten the present hours of work performance? And also, what type—not whose make. In all the written data relating to milling machines and their many good qualities, the writer has been unable to discover anything which would enlighten him in such manner that he could know intelligently and to a certainty which type of machine would be the most desirable for the class of work to be operated upon. It has been found during investigation preparatory to purchase, in answer to the all-important question, How much work will the milling machine perform in a given length of time, and how will that amount compare with the work produced from the planer in the same time? that the builders of

ing single heads and having a cutting speed of 22 ft. per minute. The spindle of the milling machine makes 34 revolutions per minute, while the platen travels 13 in. in the same interval. The platen travel per minute has been doubled after coming to the works without affecting the cutter rotation. Another item of importance brought out was the fact that the cutters were colder and held their cutting qualities longer when the speed of the platen was increased and the work forced harder against them, thus conclusively demonstrating, to the writer, at least, that it is frictional contact which tends to dull the cutters and wear them away by grinding, and not the actual work performed. Memoranda kept during the past year also indicate the cost for renewals for cutters and grinding to be about 25 per cent. less than the running expenses for planer tools.

Another important practical result brought about by the milling machine after it was in full service was the total abandonment of three planers and one shaper, previously used on this work, all of which now goes to the miller, and an increase in the capacity of production of over 25 per cent.; thus at the same time bringing about a greater uniformity of work than could possibly have existed under other conditions, and, lastly, causing a reduction in the pay-roll, not from a reduction of wages, but because fewer men were required.

These figures from the milling machine are not conclusive nor satisfactory. I think the platen travel of this type of machine can be increased to 20 in. per minute under the same conditions for "roughing off" work and leaving enough for finishing. I speak now only of cast-iron; steel and other metals would be slower in proportion. There are to-day a thousand-and-one varieties of heavy work being done slowly on planers

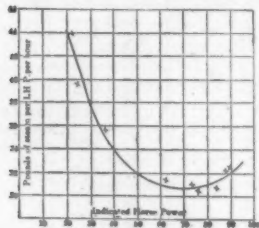


Fig. 5.

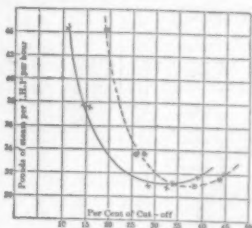


Fig. 6.

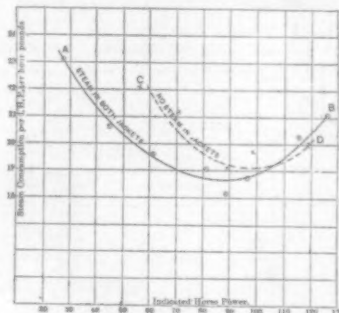


Fig. 7.

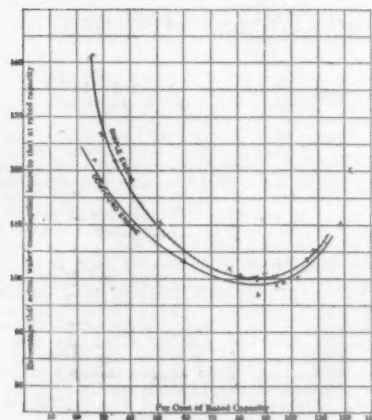


Fig. 9.

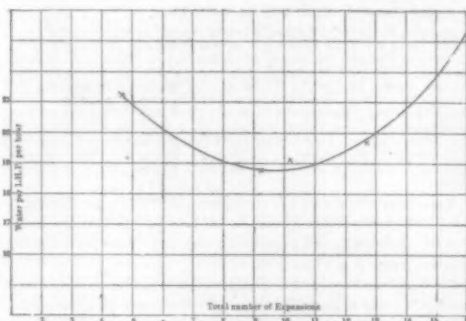


Fig. 8.

Tests of Simple and Compound Engines.

machine tools give nothing definite whereby we can base our calculations. They confine themselves generally to the superiority of their manufacture over competitors, which we always concede.

In the example which I shall quote, one manufacturer of both planers and milling-machines, who knew from personal observation just what the class of work was, expressed himself favorable to the planer as being the machine best adapted for it. But a decision being made in favor of the milling-machine, and the type known as a "slabber" being chosen, it was bought and placed in position in the works, especial attention being given to its foundation, and warning being given to its maker that it would be subjected to the severest duties in its battle for supremacy over its rival, the planer, and the true merits of the milling machine demonstrated in comparison if possible. I would like to add in parentheses, I have always thought the builders of this special machine were a little bit more slack about it than they would have been if they had not received our "warnings."

The planer used in this test is of modern build being about three years old, carries two heads, and is 30 x 30 in x 8 ft., having a table travel of 27 ft. per minute. The tools used are Mushet's steel, 1 1/2 in. square. Both machines are fully equipped with chucks and clamping devices for suitably holding the work, and in charge of first-class mechanics of long experience, and between whom considerable rivalry existed. The favorable results from the milling-machine in comparison to the planer are somewhat surprising, even to those who know it best.

Eight pieces of cast iron, 17 in. long, having a surface 8 in. wide and 1 1/2 in. down each side, to be rough finished, are done on the planer in 4 1/2 hours, the pieces being placed on the platen in two rows, and both heads being used simultaneously. The time required by the milling-machine was just 41 minutes, straddle-mill cutters being used and one casting being operated upon at a time, the amount of metal removed being about one-sixteenth of an inch in both cases.

Another class of work was cast iron strips 16 in. long, 3/4 in. thick and 1 1/2 in. wide, to be rough finished all over. The best time made on the planers was found to be at the rate of four every 30 minutes, while the milling machine turned off six every 41 minutes. The planers in this case were small modern machines, carry

which should be done rapidly on milling machines, but the milling machine must be designed and patterned closely upon the lines of the modern planer and must universally reach over and around the work on the platen, and be as easy to handle and operate as the present planer is to-day.

Another thought brought out from close association with a miller is the inconvenience at present existing for clamping and chucking the work. If it requires 20 minutes to clamp a piece on the planer and one hour to plane it, and only requires 20 minutes milling, but one hour is used up in clamping it securely on the miller, the latter becomes an expensive tool, and all the argument is in favor of the planer.

I have said nothing about the overhung arm type of milling-machine in this paper, as it covers a field of its own in competition with small planers, shapers and slotters, doing nice work and reasonably rapid, but as yet not up to what its possibilities are, the reasons being chiefly that it is lacking in rigidity and strength in its component parts.

Another valuable paper is one by Prof. R. C. Carpenter on Comparative Tests of Simple and Compound High Speed Engines.

The results of these tests which are of special interest are those showing the variation in economy with change of load in simple and compound engines. The engines tested were a simple automatic engine with a fly-wheel governor, and a tandem compound engine for similar work. The customary apparatus for thorough engine tests was used in this case. The results of the tests are shown in the accompanying figs. Nos. 5 to 10. The results are shown in these diagrams, first for the variation in pounds of steam per horse power with various loads, and second, for the percentage that the actual weight used bears to that used at the rated capacity.

The most important practical result is shown in Fig. 10 from which it appears that the compound engine was less affected by change of load than the simple engine under the conditions of the test. These conditions approximate very closely to those under which these classes of engines are usually worked and indicate results directly opposite to the general belief regarding the performance of the two classes of engines. The simple engine was rated at eighty horse power and has a cylinder

TABLE I.—HEAT GENERATED BY GAS AND OIL LAMPS.

Class of lamps.	Number of tests.	Velocity of air over car roof in miles per hour.	Heat per hour per 32 candle power in B. T. U.		Total heating power per cu. ft. of gas or oil.
			Total.	Impart'd to air around the lamps.	
Gas.	9	0	4,045	....	1,233
"	10	0	4,084	....	1,261
"	4	0	....	3,226	....
"	3	40	....	1,847	....
Oil argand bur.	12	0	6,278	....	18,850
"	11	0	5,871	....	3,583
"	6	0	....	1,942	....
"	7	40	....	2,300	....
Oil flat flame.	21	40	....	2,039	....
"	28	0	....	....	18,720

TABLE II.—RATE OF OIL CONSUMPTION IN ARGAND AND FLAT FLAME LAMPS, TWO FLAMES BURNED IN EACH TEST.

Number of test.	Duration of test.	Class of flame.	Oil burned per hour.	Candle power sum of two flames.	Oil per hour per 32 candle power
12	4.5	Argand.	.333	32.2	.331
21	2.0	"	.344	33.5	.329
23	5.0	Flat.	.152	15.9	.306

TABLE III.—CANDLE POWER AT VARIOUS ANGLES.

Time p. m.	Candle power corrected for mirror and rate of burning of candle.						Remarks.
	Horizontal.	15°.	30°.	45°.	60°.	75°.	
10.30	39.6			34.9	34.3	26.4	Test No. 24. Gas lamp. Average candle power for all positions below a horizontal plane = 32.5.
11.00	37.2	37.2	33.2	35.9	35.9	23.9	
Midnight	36.1	36.1	33.4				
12.25	37.7	37.7	32.5	33.8	35.1	26.0	
Sum.	150.6	111.9	99.1	104.6	105.3	76.3	
Average.	37.7	37.0	33.0	34.9	35.1	25.4	

a. m.	3.00	3.50	4.20	Sum.	Average.	Remarks.
23.1	15.9	18.9	16.8	10.5	4.9	Test No. 26. Argand oil lamp. Average candle power for all positions below a horizontal plane = 6.1.
18.2	16.8	15.4	12.6	8.4	4.2	
19.6	16.8	15.4	11.2	8.4	3.5	
60.9	52.5	49.7	40.6	27.3	12.5	
20.3	17.5	16.6	13.5	9.1	4.2	

p. m.	9.25	10.30	10.55	Sum.	Average.	Remarks.
26.0	24.7	20.6	19.2	9.6	4.1	Test No. 31. Argand oil lamp. Average candle power for all positions below a horizontal plane = 6.2.
24.5	24.5	21.9	16.8	9.0	4.5	
25.5	25.5	22.8	18.1	9.4	4.7	
76.0	74.7	65.3	54.1	28.0	13.3	
25.3	24.9	21.8	18.0	9.3	4.4	

a. m.	4.45	5.00	5.15	Sum.	Average.	Remarks.
11.0	11.7	11.7	8.3	6.2	4.1	Test No. 27. Flat flame oil lamp. Average candle power for all positions below a horizontal plane = 5.3.
11.0	11.0	10.4	8.3	4.8	4.5	
10.4	10.4	9.7	7.8	4.8	4.8	
32.4	33.1	31.8	24.4	15.8	13.4	
10.8	11.9	10.6	8.1	5.3	4.5	

12 in. in diameter by 14 inches stroke and was working between the limits of eighty pounds of steam by gauge and the atmospheric pressure. The compound engine was rated at one hundred horse power and has cylinders 9 and 11 in. in diameter by 14 in. stroke, and was working between the limits of one hundred and twelve pounds gauge pressure and ten pounds absolute. The speed of the two engines was 245 revolutions per minute for the simple engine, and 205 revolutions for the compound.

Another short and practical paper was one by Prof. J. E. Sweet on the use of the Weaving Shed Form of Construction for Modern Machine Shops. We expect to publish this paper in a subsequent issue.

A paper which is of interest to our readers on account of its connection with the subject of car lighting and ventilating was one by Professor Jacobus on the heat generated per candle power by oil and gas lamps. The experiments described in this paper were made in the course of a general investigation to determine the relative cost of obtaining the average illumination afforded by gas and kerosene lamps in railroad service.

The candle power measurements show that the most improved form of the Argand railroad lamp consumed the same amount of kerosene per candle power as the best form of flat flame lamp in which two wicks are used with an air supply between them, the combustion of the two wicks uniting so as to form a single flame. The maximum light which could be readily maintained with the attention available in railroad service was 10 candles with the Argand flame, and 8 candles with the flat flame. The oil gas was burned in a four-flame Pintsch burner; affording, under average railroad service, 32 candles. The lamps tested were taken from cars in which they had been in active service. Each lamp was suspended from a section of a car roof. These sections were cut from a car that had been in service and were covered with roofing tin in the usual way.

The lamp to be tested was placed in a box about 4 ft. square, and full observations were made upon it of the temperature, its candle power, the velocity of the air supply and discharge as shown by anemometers in the air supply and discharge pipes, and with a blower so connected that it could deliver a stream of air over the

top of the box which would correspond to various speeds of the car.

To make a complete measurement after all the data as above have been recorded, the lamp is removed and in its place is substituted a steam radiator. The radiator is furnished with sufficient steam to heat the air the same amount and produce the same anemometer readings as were observed in the test of the lamp. The heat given out by the radiator will then be the same as the heat generated by the lamp and may be measured by weighing the steam condensed by the radiator. The heat generated by the various lamps, the amount of oil used and the candle power as determined in several of the tests are given in the following tables.

A considerable number of papers were read which will be of value to engineers engaged in the special lines of works to which they refer, but which are not of general interest. Among these may be mentioned a paper on "Propeller Efficiency," by Professor Durand; "A New Process of Cutting Cam," by W. A. Gabriel; "An Analysis of the Shaft Governor," by F. M. Rites; "A Simple Difference Machine," by Geo. Richmond; "Strains in Lathe Beds," by G. W. Bissell; "Graduating Steam Radiators," by J. T. Hawkins; and "A Recording Pressure Gauge for Extremely Low Pressures," by W. H. Bristol. Mr. Samuel Webber presented a paper of interest on "Driving Belts," which contains several tables giving results of tests of various belts, but there are so many variables in the results as tabulated, that the paper in its present shape is of comparatively small practical value. Papers such as that would be of much greater value if the results were reduced to something near the same basis for comparison, and were plotted graphically.

Mr. J. B. Stanwood read a paper on the strains in the rims of the fly-wheel wheels produced by centrifugal force in which calculations are made to allow for the bending action of the part of the rim between the spokes by reason of the centrifugal force. It is advised that wheels which are cast in halves, if very thin rims are to be employed, should have double arms along the line of separation. For segmental wheels the construction by which the arms are bolted to the junction of the segments of the rim is preferable to that in which the segments are bolted together midway between the arms. Wheels may be specified to be made too light in weight, for with a given diameter and weight there is a minimum safe weight dependent upon the principles outlined above. Fly wheels calculated for a given coefficient of steadiness are frequently lighter than the minimum safe weight. Mr. Stanwood deduces the following formulas for the approximate safe weight of fly wheels. In these formulas W is the total weight of the wheel in pounds, b is the width of the face of the wheel in inches, d is the diameter wheel in inches, and N is the number of arms.

Total weight of wheel: for solid wheel,

$$W = \frac{.76 d^2 b^2}{N^2} \text{ to } \frac{.86 d^2 b^2}{N^2} \text{ in pounds}$$

For segmental wheels with joint between arms:

$$W = \frac{1.05 d^2 b}{N^2} \text{ to } \frac{1.3 d^2 b}{N^2} \text{ in pounds.}$$

Among the theoretical papers which are of value is one by Prof. DeVolson Wood on "Hydraulic Reaction Motors," which is really a treatise on hydraulic turbines and jet propellers, and is worked out in Professor Wood's usual thorough style. The line of reasoning, which is apparently followed, is very similar to that used in Bodmer's hydraulic motors. This book is such a complete treatise on water wheels that we are surprised to find no reference made to it in Professor Wood's paper.

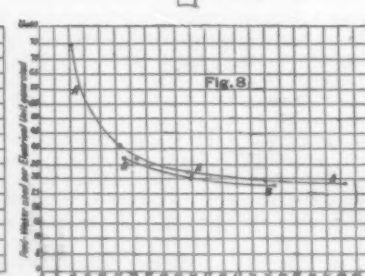
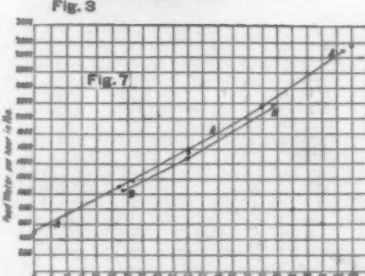
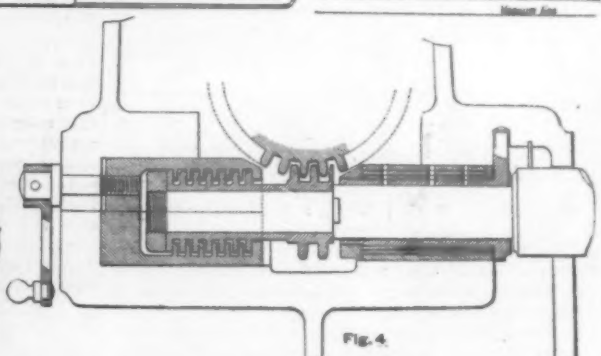
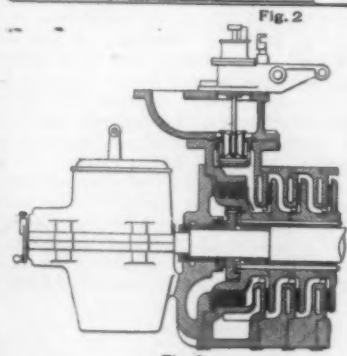
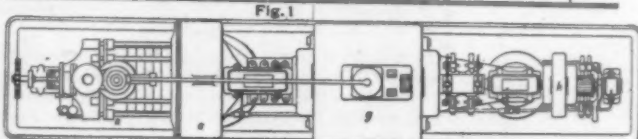
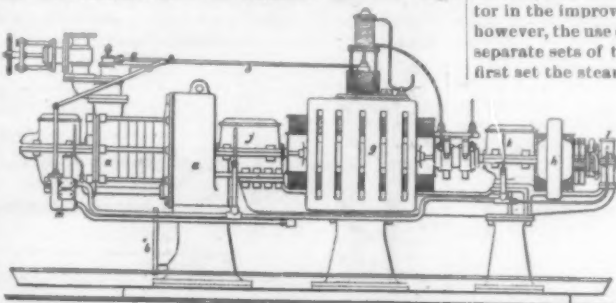
Another treatise which will fill about 65 pages of the transactions and contains several folding plates, is one on the "Refrigeration Process," by Geo. Richmond. A short paper which may be allied with the one just mentioned is that on "Negative Specific Heat," by Professor Wood.

A Condensing Steam Turbine.

A central station is approaching completion at Cambridge, England, which is especially novel in that it is the first applications of large steam turbines to commercial work. The plant consists of three condensing steam turbines directly connected to alternating dynamos, each intended for an output of 120 electrical units per hour or approximately 160 electrical horse power. The air pumps for the condensers are operated by separate steam engines. Steam is supplied at present by two Lancashire boilers, each 30 ft. long and 7 ft. 6 in. in diameter, intended for a working pressure of 140 lbs. to the square inch. There is a Green superheater for superheating the steam on its way to the turbines. The turbines are intended to expand the steam from the boiler pressure to a condenser pressure of about one pound absolute. They are to run at 4,800 revolutions per minute, and each is coupled directly to a two poled alternator giving 60 amperes at 2,000 volts and the exciter is coupled to the same shaft. The arrangement of the machines is shown by figs. 1 and 2 in which a is the turbine, g the alternating dynamo and h the exciter. The arrangement of the various parts of a turbine is shown in fig. 3, which is a partial section. Steam enters through the double beat valve shown in this view and passes through the successive channels as indicated. Each part of the engine it will be seen is an outward flow turbine. The turbine blades project from the surface of the revolving discs and are arranged in a series of concentric rings. The fixed guide blades pass in spaces between these rings, being carried

by annular discs which are a part of the case. The heights and apertures of the turbine blades on each disc are adapted to the increasing volume of the steam as it expands. The height to which the turbine blades project above the disc in which they are secured varies from $\frac{1}{8}$ to 1 in. The whole number of rings of blades in the machine tested, to which reference will be made, was 35. These blades are made of strong sheet brass and show no signs of wear after continued use. The first six discs are each 15 ins. in diameter and are designed to expand the steam to about atmospheric pressure, the remainder of the expansion being performed in passing the seventh disc which is 20 $\frac{1}{2}$ ins. in diameter and has a double series of rings of blades on each side through which the steam flows in parallel. The longitudinal pressure on the shaft due to the one sided character of the first six turbine discs is balanced at the high

made upon their performances by Professor Ewing, Professor of Engineering at the University of Cambridge. An account of Professor Ewing's tests is given in *Engineering* to which we are indebted for our illustrations and from which we abstract the following particulars of the test. The machine tested was a steam turbine combined with an alternating current dynamo capable of an output of about 134 electrical horse power. In previous tests it had been found that the consumption of steam varied from 27.6 lbs. of water per electrical horse power at full loads to 32 lbs. at one-third load. In the present tests the same turbine was used, but some additional rings were inserted at the high pressure end to enable it to use higher pressures more effectively. The vacuum was improved by the use of a large air pump and by admitting the injection water at a point in the exhaust pipe closer to the turbine, and there was a new governor. The chief factor in the improvement which has been brought about is, however, the use of moderately superheated steam. Three separate sets of trials were made Aug. 11 to 13, 1892. In first set the steam was superheated by means of the hot



Rate of Electrical Output in Board of Trade Units, Per Hour.

A A.—Steam superheated to about 40° Fahr., continuous and alternating current trials.
B B.—Steam superheated to 40° Fahr., continuous current trials.

Trials of Parsons' Steam Turbine and Dynamo.

pressure end by a revolving baffle piston shown in fig. 3. Any small amount of longitudinal thrust which remains unbalanced is received by an adjustable thrust bearing at the end of the spindle, which is shown on a larger scale in fig. 4. The worm gear, which is shown in this figure, is used to operate an oil pump which returns the oil to the reservoir after it has passed through the various bearings, and also for operating the double beat steam valve by means of the connections, shown in fig. 1. By this means the valve is lifted once in 28 revolutions of the main shaft, and steam is therefore admitted in a series of gusts. The duration of these gusts is regulated by a solenoid, which is controlled by the outflowing current, and acts as a governor. At full loads the gusts of steam become blended into an almost continuous blast, the lift valve closing only momentarily, or not at all, in each of the periodical movements. The action of this governor was most satisfactory. An indicator was applied below the double beat valve, and a record of the pressure during the periodical admission was made by pulling the paper drum of the indicator around by hand as steadily as possible. Figs. 5 and 6 are examples of diagrams obtained in this way. In fig. 5 the load was about one-half the maximum, and in fig. 6 it was about three-fourths. The pressure which these diagrams show during admission is about 4 lbs. less than that shown at the same time by a pressure gauge on the steam pipe above the governor valve.

This design of turbine was adopted for the Cambridge central station after exhaustive experiments had been

gases from the boiler furnace and the temperature approached but did not exceed 400 deg. Fahr., which corresponds to about 70 deg. superheating. In these tests a continuous current armature was used and the amount of feed water was determined for different degrees of output. In the second set of trials a special furnace was arranged to superheat the steam to a higher temperature, but the arrangements were otherwise the same as before. In the third set of trials the alternating current armature was used giving 2,000 volts at a speed of 4,800 revolutions per minute. The results of these are summarized in the accompanying table, and are shown graphically by the diagrams figs. 7 and 8.

It appears from these tables that the principal advantage is realized by moderate superheating, sufficient to prevent or reduce condensation on entering the turbine and to keep the steam dry during its expansion, thereby reducing the internal resistance. The further advantage realized by superheating to 465 deg. is seen to be comparatively small specialty at high loads. It appears by the temperature of the turbine case that this amount of superheating not only kept the steam dry throughout its whole course but left it still considerably superheated at the end. The consumption of feed water as given in the table is the gross feed water supplied by a feed pump to the boiler which supplies the turbines with steam without making any allowance for losses. The steam for the air pump and condenser was supplied by an auxiliary boiler and is not included. It will be seen that the feed water used for electrical horse power output of the

dynamo is about 21 lbs. at full load which is a remarkably good showing and will compare favorably with the average steam engine of the ordinary type. Professor Ewing says "To facilitate comparison with other engine trials it may be useful to estimate from these results what may, by analogy, be called the indicated horse power of the turbine, that is to say, the mechanical work done by the steam on the turbine blades. The curves of fig. 7 are nearly straight lines, and by prolonging them backwards to meet the base line, produced, it appears that the idle work, that is to say the work done without useful output, was equivalent to 27 kilowatts or 36 H. P. The effective work at full load was 134 electric horse power. Hence, if the idle work had the same value at full load as when the machine was running light, the total work done by the steam at full load would be 170 H. P., and the effective work would be 79 per cent. of this. But the idle work certainly increased when the machine was loaded, and it will be nearer the truth to assume that the effective work is not more than 75 per cent. of the total work. On this basis the consumption of steam at the rate of 20.9 lbs. per electrical horse power is equivalent to 15.7 lbs. per indicated horse power hour.

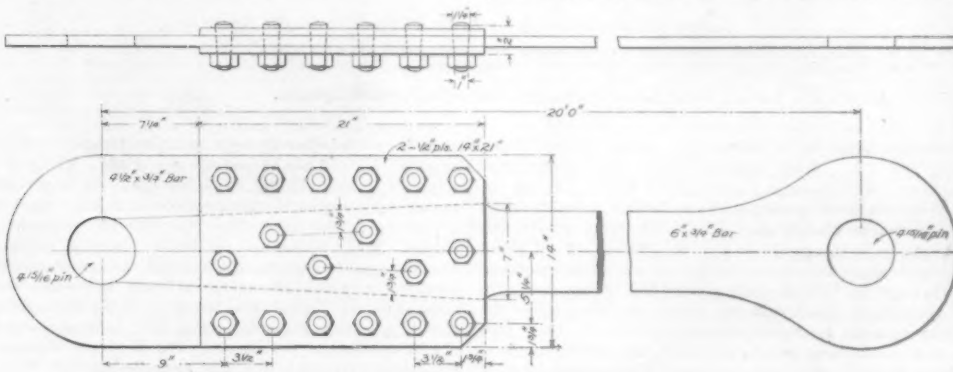
TESTS OF PARSONS' CONDENSING STEAM TURBINE.

Boiler pressure, gauge; lbs. per sq. in.	Temperature of steam; Fahrenheit.	Load in electrical horse power.	Feed water per hour, pounds.		
			Total.	Per electrical horse power.	
96	335	0.1	180	...	Steam superheated by gases from boiler furnaces. Continuous current armature.
102	365	13.7	760	55.6	
100	356	26.2	1,110	30.7	
102	400	65.9	1,590	24.1	
100	390	99.8	2,170	21.7	
103	398	136.7	2,900	21.2	Extra superheating. Continuous current.
102	463	37.9	1,090	28.0	
102	498	66.3	1,480	22.3	
101	465	105.1	2,170	20.7	
90	367	42.4	1,180	27.8	Steam superheated by gases from boiler furnace. Alternating current, water resistance.
97	394	66.9	1,550	23.2	
103	399	141.0	2,970	21.0	

Replacing an Anchor Bar on a Suspension Bridge.

We gave last week a note concerning the replacement of an anchor bar in the smaller suspension bridge at Niagara Falls, which was somewhat misleading in one or two points. Since the publication of that note we have received a blue print of the new bar and a more accurate description of the way in which it was put in. The suspension bridge referred to is the one near the Falls, which, as is well known, is a highway and foot bridge, having a carriageway 15 ft. wide and a promenade.

One of the anchor bars was found to have been broken and the break was attributed to the steel having been burned when the bar was making. The construction of the new bar is very clearly shown in the engraving. One end is the form of an ordinary eye-bar; the other end is made by a U-shaped piece which is connected with the shank of the bar by a splice plate on either side secured by taper bolts. This arrangement was necessary because the bar could

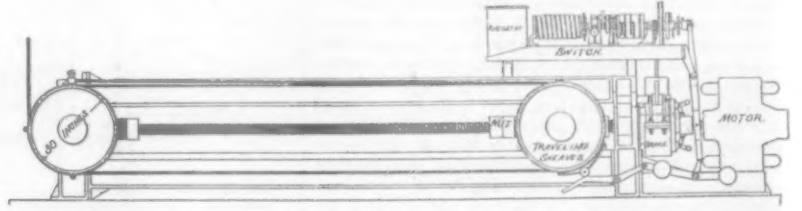
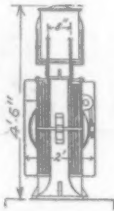


Anchor Bar for Niagara Suspension Bridge.

not be slipped over the back pin. The connection was made to that pin, first, by slipping the U-piece around it securing it, as shown in the engraving. The bolting was done while the bar was turned up in a convenient position. The bar was then turned down nearly to its final position. It had been made slightly short so as to bring the proper strain on it at its ordinary temperature. When turned down, after the bolting had been done on the lower end, it was warmed sufficiently to make it somewhat too long. The warming was done as described last week by a light fire of wood in a trough under the bar. When the bar had elongated to somewhat more than its normal length, the fire was taken away and the eye was brought opposite to the end of the front pin, and when the bar had cooled enough to permit the pin to enter, the bar was slipped into place and the continued cooling brought it into tension.

The Sprague-Pratt Electric Elevator.

A new design of electric elevator has been brought out by Frank J. Sprague and Chas. R. Pratt which possesses many interesting features. It is of the horizontal type, the motor being coupled directly to a long screw, by means of which the elevator sheaves are operated. The general arrangement of the parts is shown in the engraving. In a detailed account of this elevator by the inventors, published in the *Electrical Engineer*, it is shown that electrical elevators are practicable in a great many cases, from the fact that there are in the United States not less than 350 stations supplying currents of constant potential at from 225 to 250 volts, and no less than 400 stations supplying similar currents at from 450 to 500 volts. It is stated that this electric elevator has the following characteristics: It equals the speed and smoothness of hydraulic elevators; it will start and stop more softly; it occupies from one-fourth to one-tenth the



Sprague-Pratt Electric Elevator.

space of the hydraulic operating plant; it costs less than one-half to operate it; it is safer than the hydraulic.

The first of these machines has been in operation for a year on West Twenty-third street, New York, running at a speed of about 250 ft. per minute, and supplying freight and passenger service on both sides of the elevator for a five-story building. About every kind of accident or breakdown has been tried on this machine, and even almost vicious attempts have been made to wreck it, but as yet there have been no disastrous results to record. An improved machine of similar type has been put into the Grand Hotel at Thirty-first street and Broadway, and a contract has been signed for a nest of six high-duty elevators for the Postal Telegraph Building at Broadway and Murray street. This building is 14 stories high, and four of the elevators have a capacity of 325 ft. per minute with a live load of 2,500 lbs., and the remaining two have a capacity of 400 ft. per minute with a speed of 1,800 lbs.

Lubrication.*

BY MR. J. N. BARR.

A railroad, taken as a whole, is a machine for moving or transporting loads from point to point. The object of the railroad company owning and operating such a machine is, to handle it in such a way that the loads may be transported: first, with safety; second, with dispatch; third, at a reasonable charge; and fourth, with economy, in order that the difference between the cost of transportation and the money received therefor may make a proper return on the cost of the machine. Looked at in this light, a railroad constitutes the most complicated and magnificent piece of machinery known. In its mere existence, involving, as it does, question of property in right of way, way stations and terminal facilities, of rolling stock to meet the requirements of different loads, and of motive power to move the same, the complexity of the machine is bewildering. When this

In the Motive Power Department of a railroad, for instance, superintendence should involve a supervision: first of the quality and design of the rolling stock, motive power and machinery; second of the quality of the material used for repairs and operation of the same; and third, of the use of the above in actual service. A number of roads are to day fairly well equipped for the supervision of the items mentioned in the first and second headings, but as to the third, the actual supervision of the use of the material and machinery in service, there is grave reason to question whether this receives anything like the attention necessary to secure the best economic results. In fact, the writer is of the opinion that there is too much a tendency to-day on the part of the superintendents of motive power to keep their eyes riveted on the quality and design of the rolling stock, to investigation and testing of material for repairs, to framing *a priori* specifications for the same, and to making so-called improvements in design, while the supervision of the use of the same is delegated as a rule to what is supposed to be a much lower order of intelligence, if the amount of salary received is any criterion of intelligence.

It is certainly much easier to assume that material

should meet certain specified requirements, than it is to follow the same in service and determine therefrom what the requirements are that should be met, and this same is true of rolling stock and machinery. Development in nature advances by the survival of the fittest, the gradual elimination of the weak and imperfect. The same is true in railway machinery and supplies, and a little thought will make it clear to any one familiar with the subject, that nearly all our improvements in the past twenty-five years are of the character of development resulting from a *posteriori* consideration rather than a *a priori* reasoning.

As an illustration of the idea that supervision of the use of material is of the utmost importance, the writer has selected as a subject that of lubrication, and under this general subject, wishes to confine his remarks and illustrations entirely to the matter of lubrication of freight car journal bearings.

The Chicago, Milwaukee & St. Paul Railway Company has used since 1884 and up to the present time but one kind of oil for freight cars. The cost of oiling freight cars during 1885 was 27.76 cents per thousand miles. These figures seemed excessive, and attracted much attention. It was determined then after considerable investigation at various points, that wastefulness on the part of the men was largely responsible for the unsatisfactory results obtained. In order to exercise a close supervision over the consumption of oil, a record was kept of the amount of oil consumed at each oiling station, and this information was tabulated, as shown in statement No. 1, which gives actual figures for four divisions of the road. [A summary of this statement is published in another column.] With this information, it was a simple matter to check up the oil consumption, to compare stations handling approximately equal numbers of cars, and to determine with reasonable certainty the points at which a tendency to extravagance existed. At the same time considerable personal work was done directly on the ground at the various stations, and one foreman who would not, or could not bring the oil consumption at this station to a reasonable figure was removed from service.

In looking over the statement it was observed that at several minor intermediate points on various divisions men were employed who in the aggregate used quite a large quantity of oil. These men were removed and placed where their services were of more use to the company, and the latter had in addition the benefit of stopping these sources of oil leakage.

The results obtained from the above course is shown in statement No. 2, which gives the cost per thousand miles from Jan. 1, 1885, to Sept. 1, 1892. The total saving in 1891 as compared with 1885 is something over \$38,000, a result obtained without changing oil, with the removal of but one man, and with very slight expenditure of money in the way of supervision and clerical labor.

It might well be asked whether in affecting this economy, some other branch of the service, as for example the prompt movement of the trains were not unfavorably effected. In order to check this point a record of hot boxes was established in 1886, and the results obtained from this record are tabulated in statement No. 3. This statement shows that up to April, 1890, the number of hot boxes decreased, but from that time up to April, 1892, there was a large and abnormal increase in their number, making 1891 show as badly with reference to hot boxes as 1886, but not showing a corresponding increase in the cost of oil per thousand miles, although the increase was decided, and compared with the years immediately preceding, amounted to at least \$5,000, a sum sufficient to pay for the services of a very good man, if such services would have detected and prevented the increase.

The increase in hot boxes became quite an annoyance in the movement of trains. Division superintendents claimed that the oilers were stinting too much in the use of oil, and the usual questions as to poor oil came up. A meeting of the Master Mechanics and Master Car Builders of the road was held, and a day was spent in one of the principal yards inspecting oil boxes. The result showed that in a number of cases the packing was insufficient to bring the oil properly in contact with the journal, and in many instances the waste was permeated by a mixture of dirt and sand. The waste was frequently found in almost a pulpy condition in the front of it. In order to gain further information on these points, the following circular was addressed to all foremen of car repairers.

Hot boxes under freight cars are increasing. In order to prevent this trouble the foreman inspector at each inspecting point will be required to personally inspect incoming trains as they arrive, with the object of noting any boxes which are beginning to warm up. They will remove the lid, inspect the box carefully, and determine whether the warning arises from lack of oil, lack of packing, bad fit, of brass, grit in the

*Paper read at November meeting of Western Railway Club.

packing or from whatever cause the same may be due, and make a careful report on form 154, sending it direct to this office each day. Foremen will be held responsible for any cases of the above kind leaving their station which may be reported from the following station. This applies to time which the foremen are regularly on duty. This special report is not desired for the ordinary cases of hot boxes which have become so hot as to dry out the oil or set the packing on fire; it is only intended to cover cases in which the journals are beginning to run warm, and in which the original condition of the oiling, packing, etc., has not been changed by the heat. I feel that nine-tenths of our trouble from hot boxes arises from allowing cars to leave a station with insufficient packing, packing not properly saturated, or with a collection of grit in the box. It certainly does not arise from lack of oil as well, as we are using more proportionally now than we have been using for years.

Foremen should call the attention of their men to these cases, so that they fully understand and can see for themselves the importance of properly maintaining the condition of the boxes. I am satisfied that considerable of our trouble arises from not having the waste properly saturated that is used for packing boxes. In my opinion the waste should be soaked in the oil for at least three days before being used.

A digest of these reports received in response to this circular showed that the state of affairs, as detailed above, was general over the entire road, many boxes containing waste which had undoubtedly been placed there at least ten years before.

Instructions were then given to remove all waste from boxes of cars coming on the repair tracks, to reject all waste filled with sand, or worn out, to apply perfect dust guards, to mix sufficient new and well saturated waste with the old waste, to repack the box, and to stencil the date of such repacking on the truck side. This operation was to be repeated every six months, or as soon thereafter as the cars should reach the repair tracks.

This practice was established in September, 1891. The improvement was not definite until April, 1892, when the number of hot boxes showed a decided improvement as compared with the previous year, but still compared unfavorably with the years 1889 and 1890, as shown in statement No. 3, September, 1892, however, makes a very favorable showing, having a less number of hot boxes than any preceding September during the term of the record. By referring to statement No. 2 it will be seen that in the consumption of oil a definite improvement has also been made, so it is evident that the reductions in the number of hot boxes was not effected by increasing the amount of oil consumed.

In treating this subject the writer has studiously refrained from saying one word on the quality of the oil, the kind of waste used, the form and quality of the bearings, all of which are undoubtedly important and a discussion of the same would be interesting. But the work reported above was confined to the matter of getting improved results from what was on hand, by maintaining the boxes in good condition, and also by using judgment and care in applying the oil.

In this connection the question naturally arises whether it would not be possible to effect a further and much greater economy in the consumption of oil, the statements showing that an average cost of about 14 cents per 1,000 miles is the best that has been obtained. The writer has no hesitation in saying that unquestionably much better results could be obtained, as he has run a passenger car for several months at a cost of about 5 cents per 1,000 miles for lubrication. But it is also equally certain that with the present character of supervision, and the class of men employed in general as inspectors and oilers, such results are absolutely unattainable.

The writer has shown, however, that with a little care and attention an annual saving of \$35,000 has been effected in the comparatively minor matters of lubricating freight cars. A very important point has also been shown, namely, that no matter how much improvement may be made in any service whatever, it is unsafe to relax vigilance with the idea that the standard of efficiency will be maintained. In no way can a given standard of efficiency be maintained, except by the constant and discriminating scrutiny of the supervising power. This scrutiny should be so complete and extended as to include not only a knowledge of the amount and cost of material consumed, and any increase or decrease in the same, but should also be of such a character as to point out definitely and promptly the cause of such increase or decrease, whether due to the quality of material, the character of the men using the same, or variation in the service.

It is not the intention of this paper to formulate any theories. There is now a tendency among railway men to assign to these matters of supervision their true importance, although the discussions in our mechanical periodicals and societies are confined almost entirely to the original design of machinery and the quality of materials, while the judicious use of the same receives but a small share of attention. If this paper has any influence in directing a closer attention to this most important part of our duties its object will be fully accomplished.

La Crosse Division and Madison and Portage.

	Sept.	Oct.	Nov.	Dec.
Total oil, 1891.....	9,862	8,900	4,938	4,715
Cost per 1,000 M.....	32.5	45.3	36.8	26.4
Total oil, 1892.....	3,024	3,823	3,680	3,578
Total per 1,000 M.....	17.1	34.5	25.4	25.4

Wisconsin Valley Division.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
Total oil, 1892.....	271	271	258	305	325	332	265	497
Total cost.....	5,845	6,577	5,498	5,967	6,263	6,133	7,581	10,647
Mileage, in thousands.....	325	74	399	76	183	64	799	964
Cost per 1,000 M.....	11.1	8.8	8.6	8.5	9.1	9.6	9.6	12.3
Total oil, 1891.....	217	214	338	189	187	27	229	220
Cost per 1,000 M.....	9.5	9.7	7.7	7.6	13.0	8.1	5.6	6.1
Total oil, 1890.....	206	247	229	314	240	339	457	446
Cost per 1,000 M.....	17.4	13.7	8.3	11.5	10.4	13.0	12.1	12.5

	Sept.	Oct.	Nov.	Dec.
Total oil, 1891.....	140	405	250	309
Cost per 1,000 M.....	6.8	6.5	9.2	9.9
Total oil, 1890.....	535	421	294	297
Cost per 1,000 M.....	16.4	14.9	13.5	17.5

Chicago & Council Bluffs Division in Illinois.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.
Total oil, 1892.....	643	438	949	605	771	763	202	1,254
Total cost.....	115.70	98.64	152.32	144.90	138.78	137.34	119.76	225.72
Mileage, in thousands.....	2,701	2,077	2,304	1,931	2,136	2,165	2,976	2,045
Cost per 1,000 M.....	4.3	4.8	6.6	7.5	6.5	6.3	4.0	11.1
Total oil, 1891.....	723	604	968	736	1,183	1,076	1,201	1,347
Cost per 1,000 M.....	5.5	5.6	4.2	5.9	12.2	12.9	12.4	15.3
Total oil, 1890.....	601	400	380	170	694	905	1,100	769
Cost per 1,000 M.....	5.3	4.8	3.1	3.9	5.2	8.6	8.7	7.0

	Sept.	Oct.	Nov.	Dec.
Total oil, 1891.....	610	848	304	467
Cost per 1,000 M.....	6.2	7.2	8.0	4.3
Total oil, 1890.....	647	1,067	669	127
Cost per 1,000 M.....	5.6	9.5	7.3	7.3

STATEMENT NO. 2.—SHOWING COST OF OIL USED ON FREIGHT CARS, PER THOUSAND MILES RUN.

	1886.	1887.	1888.	1889.	1890.	1891.	1892.
January.....	19.32	15.66	12.94	14.92	11.93	11.89	13.79
February.....	17.41	13.40	12.23	14.19	12.70	11.08	14.31
March.....	14.58	11.96	12.38	12.06	11.76	11.61	12.34
April.....	16.45	15.15	14.52	14.59	12.97	12.97	15.25
May.....	20.01	19.10	15.46	14.07	11.64	16.53	15.46
June.....	22.10	19.78	16.24	15.39	13.93	17.46	15.21
July.....	23.23	19.45	15.99	17.46	11.52	14.48	15.15
August.....	22.84	17.46	15.97	16.17	14.01	19.27	16.51
September.....	20.66	15.19	14.25	15.36	12.84	15.38	15.56
October.....	14.76	11.33	13.99	18.92	15.63	17.01	.....
November.....	17.49	13.23	14.51	13.60	15.43	15.73	.....
December.....	15.03	12.84	14.03	11.90	15.43	12.35	.....
Average.....	19.09	14.99	14.33	14.38	13.49	15.18	.....

Mileage, 1890, 235,140,549; 1891, 230,774,963; 1892, 261,400,022; 1893, 230,990,286; 1894, 263,983,840; 1895, 305,482,541.
(Year 1895, cost per thousand miles—27.78 cents.)

STATEMENT NO. 3.—HOT BOXES UNDER FREIGHT CARS HAVING BEARINGS REMOVED OR REPLACED.

	1886.	1887.	1888.	1889.	1890.	1891.	1892.
January.....	231	229	280	315	290	440	625
February.....	217	164	243	145	162	408	481
March.....	291	435	491	294	257	493	719
April.....	477	774	602	368	425	754	690
May.....	1,008	1,056	636	382	411	811	681
June.....	1,648	1,147	749	282	287	1,092	673
July.....	1,545	900	732	323	758	1,153	946
August.....	1,422	815	528	509	738	1,354	856
September.....	1,554	812	733	773	789	1,806	712
October.....	1,294	837	715	700	997	1,313	.....
November.....	932	679	491	650	923	1,047	.....
December.....	459	711	220	320	776	754	.....
Total.....	11,711	8,506	6,448	5,284	7,078	11,630	.....

The Upper Lakes Channels.

The plans and specifications for the ship channels between Duluth, Chicago and Buffalo have at last been completed, and some idea can be obtained of the magnitude of this great undertaking. The work is to be carried out in eight sections. The first consists of the improvement of two shoals in St. Mary's River above the canal, and will require the excavation of a channel 300 ft. wide at the bottom and about 3,000 ft. long. The estimated amount of work is about 90,000 cu. yds. of boulders, clay, sand, gravel and possibly hardpan. Bids on the section will be received at the United States Engineer Office, at Detroit until noon, Dec. 17. The second section requires the excavation of a channel about 18,500 ft. long, containing 380,000 cu. yds. of similar material to the first section, through Little Mud Lake, St. Mary's River. Bids for this section will be received until Dec. 14. The third section requires the removal of about 90,000 cubic yards of limestone rock to make a channel about 3,000 ft. long near Sailors Encampment Island in St. Mary's River. Bids on this section will be received until Dec. 9. The fourth section will require the removal of about 67,000 cubic yards of earth to form a channel 3,000 ft. long, about 1½ miles below Sailors Encampment Island, for which bids will be received until Dec. 16. The fifth section comprises the improvement of a number of small shoals at the foot of Lake Huron. The excavation will consist of about 250,000 cubic yards of earth, proposals for which will be received up to Dec. 15. The sixth section requires the removal of 950,000 cubic yards of clay and sand for the improvement of the St. Clair Flats. The channel when completed is to begin at the deep water of the St. Clair River above the St. Clair Flats canal, with a bottom width of not more than 650 feet, thence

narrowing gradually to the canal for a distance of about 3,000 feet; thence for the full width of the canal through its entire length of 7,200 feet; and, finally, widening out into a channel 17,000 feet long, and not more than 800 feet broad at the bottom, which ends in the deep water of Lake St. Clair. Bids on this section will be received until Dec. 12. The seventh section, another large portion of the undertaking, comprises the improvement of Grosse Pointe Flats, in Lake St. Clair, and is estimated to require the removal of from 1,200,000 to 2,000,000 cubic yards of earth, depending on the final width of channel required by the engineer officer in charge. The bids on this section will be received until Dec. 10. The eighth section comprises the improvement of the bar at the mouth of the Detroit River. The channel will be about 23,500 feet long, and will require from 410,000 to 1,080,000 cubic yards of earth excavation, depending on the width finally selected by the engineer officer in charge. Bids for this work will be received until Dec. 13.

A depth of 21 ft. is required in the first, second, third, fourth, fifth and eighth sections, and a depth of 20 ft. in the sixth and seventh. The side slopes are to be at the rate of two horizontal to one vertical. All excavated material is to be dumped at points designated by the United States agent in charge of the work, and the contractor for any section is required to remove all material that may be shoved or deposited in any part of the channel on which he is engaged.

Work is to begin on or before May 15, 1893. The total of the payments earned for excavation at the end of the first working season shall be at least one-fifth of the estimated cost of the entire contract; at the end of the second working season at least three-fifths of the same; and the work is to be entirely completed at the end of the third season.—Engineering Record.

Winding Arrangement for Tape Measures.

An improved but simple arrangement for winding measuring tapes is shown in the engravings. It will be seen that the handle extends to give a good leverage and is easily opened. The flush handle commonly used on steel tapes is a great improvement over the old style surface handle, but even these flush handles are objectionable, because they have to be opened by inserting the thumb nail and their construction allows only a short handle and small knob. The device shown is intended to overcome these objections.

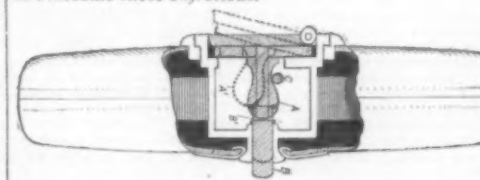


Fig. 1.

Fig. 1 shows the position of the handle and inside of winding drum when closed, also the mode of opening it. The inside of the winding drum forms the receptacle for the folding handle and knob. B shows a pin which extends one-eighth inch beyond the surface of the case, and which, by slight pressure, throws out the handle on the opposite side. A shows the handle knob when closed; A' shows it when pressing out for opening; C shows the spring which holds the knob and handle in place when closed.

Fig. 2 shows it open, ready for use. The handle, upon



Fig. 2.

opening, swings out, giving the handle double length for leverage. This construction allows the use of an extra long knob, and these features render the winding of the tape exceptionally easy and convenient. This tape is made by the Lufkin Rule Co., Saginaw, Mich.

English and American Locomotives.

The following very interesting letter appears in *The Engineer* of Nov. 18. The initials are doubtless those of Mr. W. M. Acworth, so well known to many of our readers.

Some months back, when the question of English vs. American locomotives was being discussed in your columns, I ventured to urge that though an American engine might burn more coal per pound of steam, and so appear per unit of power developed a more extravagant machine, it yet might on the whole be a more economical instrument of traffic, if its greater tractive force enabled the management to run in one train loads which with our smaller English engines require two trains. I instanced not a few train in England which had been divided simply because English engines could not haul them, and pointed out that if a railway is worth £100,000 per mile—and our great main lines are certainly not worth less—the rent of each mile of one road, for the time necessary for the passage of an extra express—say, twenty minutes—is about 2s. In other words, assuming that an English engine hauls 200 tons at a given speed

STATEMENT NO. 1.—SHOWING AMOUNT OF OIL USED FOR FREIGHT CARS AT CERTAIN POINTS ON THE C. & M. & ST. P. RY. IN 1890-91-92.

Chicago and Milwaukee and Ecanston Divisions.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
Total oil, 1892.....	1,859	1,708	1,751	1,701	1,832	2,022	2,236	2,422
Total cost.....	346.77	320.94	326.88	319.43	351.97	371.63	416.15	447.39
Mileage, in thousands.....	1,510	1,309	1,319	1,314	1,414	1,623	1,717	1,892
Cost per 100 M.....	15.5	15.1	14.1	15.0	16.9	18.4	18.5	17.9
Total oil, 1891.....	2,355	2,660	2,566	3,053	3,639	3,328	3,335	4,334
Cost per 1,000 M.....	21.4	16.5	25.5	37.9	35.4	34.5	28.2	38.2
Total oil, 1890.....	2,087	2,701	2,826	2,915	3,197	2,985	3,222	3,226
Cost per 1,000 M.....	26.9	16.5	25.6	20.0	27.6	27.8	25.8	26.4

La Crosse Division and Madison and Portage.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
Total oil, 1892.....	4,107	4,321	4,708	4,583	4,754	4,335	4,721	5,199
Total cost.....	772.29	786.77	883.45	873.00	903.92	834.51	894.36	991.46
Mileage, in thousands.....	2,445	2,558	2,964	2,768	2,594	2,651	2,859	3,599
Cost per 1,000 M.....	31.6	31.0	29.6	31.5	34.9	31.6	31.4	28.2
Total oil, 1891.....	3,252	3,390	3,115	3,148	3,691	4,289	4,932	5,700
Cost per 1,000 M.....	21.7	19.4	30.7	31.7	30.8	33.8	31.4	28.2
Total oil, 1890.....	1,499	1,782	2,313	2,337	2,425	2,934	3,591	1,991
Total per 1,000 M.....	14.4	15.0	29.0	21.8	17.9	29.8	34.1	30.8

dynamo is about 21 lbs. at full load which is a remarkably good showing and will compare favorably with the average steam engine of the ordinary type. Professor Ewing says "To facilitate comparison with other engine trials it may be useful to estimate from these results what may, by analogy, be called the indicated horse power of the turbine, that is to say, the mechanical work done by the steam on the turbine blades. The curves of fig. 7 are nearly straight lines, and by prolonging them backwards to meet the base line, produced, it appears that the idle work, that is to say the work done without useful output, was equivalent to 27 kilowatts or 36 H. P. The effective work at full load was 134 electric horse power. Hence, if the idle work had the same value at full load as when the machine was running light, the total work done by the steam at full load would be 170 H. P., and the effective work would be 79 per cent. of this. But the idle work certainly increased when the machine was loaded, and it will be nearer the truth to assume that the effective work is not more than 75 per cent. of the total work. On this basis the consumption of steam at the rate of 20.9 lbs. per electrical horse power is equivalent to 15.7 lbs. per indicated horse power hour.

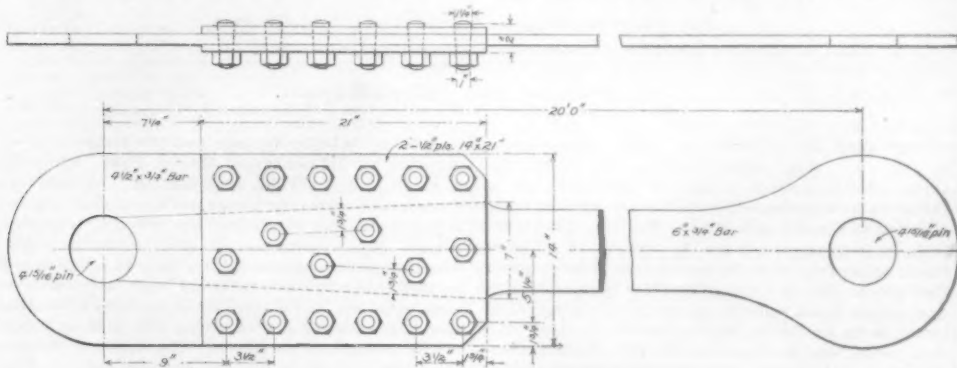
TESTS OF PARSONS' CONDENSING STEAM TURBINE.

Boiler pressure, gauge, lbs. per sq. in.	Temperature of steam, Fahrenheit.	Load in electrical horse power.	Feed water per hour, pounds.		
			Total.	Per electrical horse power.	
96	335	0.1	480	...	Steam superheated by gases from boiler furnaces. Continuous current armature.
102	365	13.7	760	55.6	
100	356	56.2	1,110	30.7	
102	400	65.9	1,530	24.1	
100	390	99.8	2,170	21.7	
103	398	136.7	2,960	21.2	Extra superheating. Continuous current.
102	463	37.9	1,060	28.0	
102	468	66.3	1,480	22.3	
101	465	105.1	2,170	20.7	
99	367	42.4	1,180	27.8	Steam superheated by gases from boiler furnaces. Alternating current, water resistance.
97	394	66.9	1,550	23.2	
103	399	141.0	2,970	21.0	

Replacing an Anchor Bar on a Suspension Bridge.

We gave last week a note concerning the replacement of an anchor bar in the smaller suspension bridge at Niagara Falls, which was somewhat misleading in one or two points. Since the publication of that note we have received a blue print of the new bar and a more accurate description of the way in which it was put in. The suspension bridge referred to is the one near the Falls, which, as is well known, is a highway and foot bridge, having a carriageway 15 ft. wide and a promenade.

One of the anchor bars was found to have been broken and the break was attributed to the steel having been burned when the bar was making. The construction of the new bar is very clearly shown in the engraving. One end is the form of an ordinary eye-bar; the other end is made by a U-shaped piece which is connected with the shank of the bar by a splice plate on either side secured by taper bolts. This arrangement was necessary because the bar could

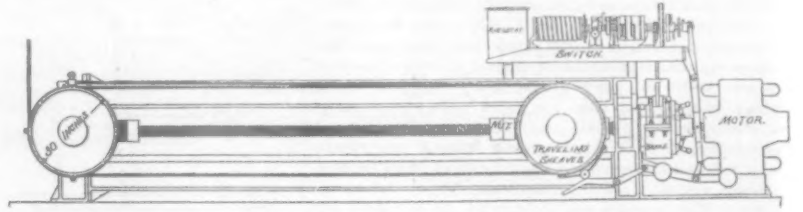
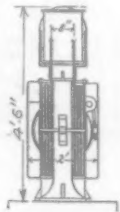


Anchor Bar for Niagara Suspension Bridge.

not be slipped over the back pin. The connection was made to that pin, first, by slipping the U-piece around it securing it, as shown in the engraving. The bolting was done while the bar was turned up in a convenient position. The bar was then turned down nearly to its final position. It had been made slightly short so as to bring the proper strain on it at its ordinary temperature. When turned down, after the bolting had been done on the lower end, it was warmed sufficiently to make it somewhat too long. The warming was done as described last week by a light fire of wood in a trough under the bar. When the bar had elongated to somewhat more than its normal length, the fire was taken away and the eye was brought opposite to the end of the front pin, and when the bar had cooled enough to permit the pin to enter, the bar was slipped into place and the continued cooling brought it into tension.

The Sprague-Pratt Electric Elevator.

A new design of electric elevator has been brought out by Frank J. Sprague and Chas. R. Pratt which possesses many interesting features. It is of the horizontal type, the motor being coupled directly to a long screw, by means of which the elevator sheaves are operated. The general arrangement of the parts is shown in the engraving. In a detailed account of this elevator by the inventors, published in the *Electrical Engineer*, it is shown that electrical elevators are practicable in a great many cases, from the fact that there are in the United States not less than 350 stations supplying currents of constant potential at from 225 to 250 volts, and no less than 400 stations supplying similar currents at from 450 to 500 volts. It is stated that this electric elevator has the following characteristics: It equals the speed and smoothness of hydraulic elevators; it will start and stop more softly; it occupies from one-fourth to one-tenth the



Sprague-Pratt Electric Elevator.

space of the hydraulic operating plant; it costs less than one-half to operate it; it is safer than the hydraulic.

The first of these machines has been in operation for a year on West Twenty-third street, New York, running at a speed of about 250 ft. per minute, and supplying freight and passenger service on both sides of the elevator for a five-story building. About every kind of accident or breakdown has been tried on this machine, and even almost vicious attempts have been made to wreck it, but as yet there have been no disastrous results to record. An improved machine of similar type has been put into the Grand Hotel at Thirty-first street and Broadway, and a contract has been signed for a nest of six high-duty elevators for the Postal Telegraph Building at Broadway and Murray street. This building is 14 stories high, and four of the elevators have a capacity of 325 ft. per minute with a live load of 2,500 lbs., and the remaining two have a capacity of 400 ft. per minute with a speed of 1,800 lbs.

Lubrication.*

BY MR. J. N. BARR.

A railroad, taken as a whole, is a machine for moving or transporting loads from point to point. The object of the railroad company owning and operating such a machine is, to handle it in such a way that the loads may be transported: first, with safety; second, with dispatch; third, at a reasonable charge; and fourth, with economy, in order that the difference between the cost of transportation and the money received therefor may make a proper return on the cost of the machine. Looked at in this light, a railroad constitutes the most complicated and magnificent piece of machinery known. In its mere existence, involving, as it does, question of property in right of way, way stations and terminal facilities, of rolling stock to meet the requirements of different loads, and of motive power to move the same, the complexity of the machine is bewildering. When this

In the Motive Power Department of a railroad, for instance, superintendence should involve a supervision: first of the quality and design of the rolling stock, motive power and machinery; second of the quality of the material used for repairs and operation of the same; and third, of the use of the above in actual service. A number of roads are to day fairly well equipped for the supervision of the items mentioned in the first and second headings, but as to the third, the actual supervision of the use of the material and machinery in service, there is grave reason to question whether this receives anything like the attention necessary to secure the best economic results. In fact, the writer is of the opinion that there is too much a tendency to-day on the part of the superintendents of motive power to keep their eyes riveted on the quality and design of the rolling stock, to investigation and testing of material for repairs, to framing *a priori* specifications for the same, and to making so-called improvements in design, while the supervision of the use of the same is delegated as a rule to what is supposed to be a much lower order of intelligence, if the amount of salary received is any criterion of intelligence.

It is certainly much easier to assume that material

should meet certain specified requirements, than it is to follow the same in service and determine therefrom what the requirements are that should be met, and this same is true of rolling stock and machinery. Development in nature advances by the survival of the fittest, the gradual elimination of the weak and imperfect. The same is true in railway machinery and supplies, and a little thought will make it clear to any one familiar with the subject, that nearly all our improvements in the past twenty-five years are of the character of development resulting from a *posteriori* consideration rather than a *priori* reasoning.

As an illustration of the idea that supervision of the use of material is of the utmost importance, the writer has selected as a subject that of lubrication, and under this general subject, wishes to confine his remarks and illustrations entirely to the matter of lubrication of freight car journal bearings.

The Chicago, Milwaukee & St. Paul Railway Company has used since 1884 and up to the present time but one kind of oil for freight cars. The cost of oiling freight cars during 1885 was 27.70 cents per thousand miles. These figures seemed excessive, and attracted much attention. It was determined then after considerable investigation at various points, that wastefulness on the part of the men was largely responsible for the unsatisfactory results obtained. In order to exercise a close supervision over the consumption of oil, a record was kept of the amount of oil consumed at each oiling station, and this information was tabulated, as shown in statement No. 1, which gives actual figures for four divisions of the road. [A summary of this statement is published in another column.] With this information, it was a simple matter to check up the oil consumption, to compare stations handling approximately equal numbers of cars, and to determine with reasonable certainty the points at which a tendency to extravagance existed. At the same time considerable personal work was done directly on the ground at the various stations, and one foreman who would not, or could not bring the oil consumption at this station to a reasonable figure was removed from service.

In looking over the statement it was observed that at several minor intermediate points on various divisions men were employed who in the aggregate used quite a large quantity of oil. These men were removed and placed where their services were of more use to the company, and the latter had in addition the benefit of stopping these sources of oil leakage.

The results obtained from the above course is shown in statement No. 2, which gives the cost per thousand miles from Jan. 1, 1885, to Sept. 1, 1892. The total saving in 1891 as compared with 1885 is something over \$38,000, a result obtained without changing oil, with the removal of but one man, and with very slight expenditure of money in the way of supervision and clerical labor.

It might well be asked whether in affecting this economy, some other branch of the service, as for example the prompt movement of the trains were not unfavorably effected. In order to check this point a record of hot boxes was established in 1886, and the results obtained from this record are tabulated in statement No. 3. This statement shows that up to April, 1890, the number of hot boxes decreased, but from that time up to April, 1892, there was a large and abnormal increase in their number, making 1891 show as badly with reference to hot boxes as 1886, but not showing a corresponding increase in the cost of oil per thousand miles, although the increase was decided, and compared with the years immediately preceding, amounted to at least \$5,000, a sum sufficient to pay for the services of a very good man, if such services would have detected and prevented the increase.

The increase in hot boxes became quite an annoyance in the movement of trains. Division superintendents claimed that the oilers were stinting too much in the use of oil, and the usual questions as to poor oil came up. A meeting of the Master Mechanics and Master Car Builders of the road was held, and a day was spent in one of the principal yards inspecting oil boxes. The result showed that in a number of cases the packing was insufficient to bring the oil properly in contact with the journal, and in many instances the waste was permeated by a mixture of dirt and sand. The waste was frequently found in almost a pulpy condition in the front of it. In order to gain further information on these points, the following circular was addressed to all foremen of car repairers.

Hot boxes under freight cars are increasing. In order to prevent this trouble the foreman inspector at each inspecting point will be required to personally inspect incoming trains as they arrive, with the object of noting any boxes which are beginning to warm up. They will remove the lid, inspect the box carefully, and determine whether the warming arises from lack of oil, lack of packing, bad fit of brass, grit in the

*Paper read at November meeting of Western Railway Club.

packing or from whatever cause the same may be due, and make a careful report on form 154, sending it direct to this office each day. Foremen will be held responsible for any cases of the above kind leaving their station which may be reported from the following station. This applies to time which the foremen are regularly on duty. This special report is not desired for the ordinary cases of hot boxes which have become so hot as to dry out the oil or set the packing on fire; it is only intended to cover cases in which the journals are beginning to run warm, and in which the original condition of the oiling, packing, etc., has not been changed by the heat. I feel that nine-tenths of our trouble from hot boxes arises from allowing cars to leave a station with insufficient packing, packing not properly saturated, or with a collection of grit in the box. It certainly does not arise from lack of oil as well, as we are using more proportionally now than we have been using for years.

Foremen should call the attention of their men to these cases, so that they fully understand and can see for themselves the importance of properly maintaining the condition of the boxes. I am satisfied that considerable of our trouble arises from not having the waste properly saturated that is used for packing boxes. In my opinion the waste should be soaked in the oil for at least three days before being used.

A digest of these reports received in response to this circular showed that the state of affairs, as detailed above, was general over the entire road, many boxes containing waste which had undoubtedly been placed there at least ten years before.

Instructions were then given to remove all waste from boxes of cars coming on the repair tracks, to reject all waste filled with sand, or worn out, to apply perfect dust guards, to mix sufficient new and well saturated waste with the old waste, to repack the box, and to stencil the date of such repacking on the truck side. This operation was to be repeated every six months, or as soon thereafter as the cars should reach the repair tracks.

This practice was established in September, 1891. The improvement was not definite until April, 1892, when the number of hot boxes showed a decided improvement as compared with the previous year, but still compared unfavorably with the years 1889 and 1890, as shown in statement No. 3. September, 1892, however, makes a very favorable showing, having a less number of hot boxes than any preceding September during the term of the record. By referring to statement No. 2 it will be seen that in the consumption of oil a definite improvement has also been made, so it is evident that the reductions in the number of hot boxes was not effected by increasing the amount of oil consumed.

In treating this subject the writer has studiously refrained from saying one word on the quality of the oil, the kind of waste used, the form and quality of the bearings, all of which are undoubtedly important and a discussion of the same would be interesting. But the work recounted above was confined to the matter of getting improved results from what was on hand, by maintaining the boxes in good condition, and also by using judgment and care in applying the oil.

In this connection the question naturally arises whether it would not be possible to effect a further and much greater economy in the consumption of oil, the statements showing that an average cost of about 14 cents per 1,000 miles is the best that has been obtained. The writer has no hesitation in saying that unquestionably much better results could be obtained, as he has run a passenger car for several months at a cost of about 5 cents per 1,000 miles for lubrication. But it is also equally certain that with the present character of supervision, and the class of men employed in general as inspectors and oilers, such results are absolutely unattainable.

The writer has shown, however, that with a little care and attention an annual saving of \$35,000 has been effected in the comparatively minor matters of lubricating freight cars. A very important point has also been shown, namely, that no matter how much improvement may be made in any service whatever, it is unsafe to relax vigilance with the idea that the standard of efficiency will be maintained. In no way can a given standard of efficiency be maintained, except by the constant and discriminating scrutiny of the supervising power. This scrutiny should be so complete and extended as to include not only a knowledge of the amount and cost of material consumed, and any increase or decrease in the same, but should also be of such a character as to point out definitely and promptly the cause of such increase or decrease, whether due to the quality of material, the character of the men using the same, or variation in the service.

It is not the intention of this paper to formulate any theories. There is now a tendency among railway men to assign to these matters of supervision their true importance, although the discussions in our mechanical periodicals and societies are confined almost entirely to the original design of machinery and the quality of materials, while the judicious use of the same receives but a small share of attention. If this paper has any influence in directing a closer attention to this most important part of our duties its object will be fully accomplished.

La Crosse Division and Madison and Portage.

	Sept.	Oct.	Nov.	Dec.
Total oil, 1891.....	8,282	8,200	4,926	4,715
Cost per 1,000 M.....	52.5	45.5	38.5	36.4
Total oil, 1890.....	3,024	3,223	3,660	3,576
Cost per 1,000 M.....	17.1	18.5	25.4	25.4

Wisconsin Valley Division.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
Total oil, 1892.....	271	371	358	305	323	322	365	497
Total cost.....	5,245	6,577	5,194	5,967	6,393	6,133	7,291	10,647
Mileage, in thousands.....	525	714	680	586	615	614	709	954
Cost per 1,000 M.....	11.1	9.2	8.6	8.5	9.1	9.5	9.6	12.3
Total oil, 1891.....	347	314	326	199	367	272	295	220
Cost per 1,000 M.....	9.5	5.7	7.7	7.6	15.0	5.1	5.6	6.1
Total oil, 1890.....	266	247	270	219	246	300	457	446
Cost per 1,000 M.....	17.4	13.7	8.3	11.5	10.0	15.0	13.1	12.5

	Sept.	Oct.	Nov.	Dec.
Total oil, 1891.....	140	433	350	230
Cost per 1,000 M.....	6.8	6.5	9.2	9.9
Total oil, 1890.....	136	421	294	267
Cost per 1,000 M.....	16.6	14.9	12.5	14.5

Chicago & Council Bluffs Division in Illinois.

	Jan.	Feb.	Mar.	April	May	June	July	Aug.
Total oil, 1892.....	645	498	849	805	771	765	782	1,254
Total cost.....	115.10	89.64	152.32	144.90	136.76	137.34	140.16	225.72
Mileage, in thousands.....	2,791	2,077	2,304	1,931	2,136	2,165	2,576	2,045
Cost per 1,000 M.....	4.1	4.3	6.6	7.5	6.4	6.3	5.4	11.1
Total oil, 1891.....	725	604	696	726	1,158	1,076	1,291	1,247
Cost per 1,000 M.....	5.5	4.8	4.9	4.9	9.9	12.2	12.9	13.5
Total oil, 1890.....	601	408	363	370	656	903	1,100	760
Cost per 1,000 M.....	5.3	4.9	3.1	3.9	5.2	8.6	8.7	7.0

	Sept.	Oct.	Nov.	Dec.
Total oil, 1891.....	430	944	994	407
Cost per 1,000 M.....	6.2	7.2	8.0	4.3
Total oil, 1890.....	847	1,067	908	597
Cost per 1,000 M.....	8.6	9.8	7.5	7.5

STATEMENT NO. 2.—SHOWING COST OF OIL USED ON FREIGHT CARS, PER THOUSAND MILES RUN.

	1886.	1887.	1888.	1889.	1890.	1891.	1892.
January.....	19.32	15.46	12.34	11.82	11.33	11.39	13.79
February.....	17.41	15.40	12.23	14.19	13.70	11.09	14.31
March.....	14.58	11.96	12.39	12.96	11.75	11.61	12.34
April.....	16.45	15.15	14.52	14.59	12.97	15.89	13.55
May.....	20.01	18.10	15.08	14.07	11.64	16.35	15.46
June.....	23.10	19.78	16.24	15.39	12.95	17.46	15.21
July.....	23.25	18.45	15.69	17.46	13.75	14.60	15.14
August.....	22.91	17.49	15.97	16.17	14.01	19.27	16.51
September.....	20.66	15.19	14.35	15.36	13.94	18.39	.....
October.....	19.76	11.32	13.69	15.92	15.63	17.01	.....
November.....	17.49	13.22	14.51	13.60	15.45	19.70	.....
December.....	15.08	12.64	14.02	11.80	15.45	12.85	.....
Average.....	19.09	14.99	14.33	14.38	13.40	15.13	.....

Mileage, 1886, 235,140,549; 1887, 250,174,065; 1888, 261,400,022; 1889, 250,990,286; 1890, 263,958,640; 1891, 305,482,941.
(Year 1888, cost per thousand miles—27.36 cents.)

STATEMENT NO. 3.—HOT BOXES UNDER FREIGHT CARS HAVING BEARINGS REMOVED OR REPLACED.

	1886.	1887.	1888.	1889.	1890.	1891.	1892.
January.....	221	229	200	215	239	400	675
February.....	317	164	243	146	182	403	481
March.....	420	425	431	240	277	493	719
April.....	577	704	602	366	425	754	690
May.....	1,008	1,059	636	293	413	931	661
June.....	1,644	1,147	747	302	397	1,082	673
July.....	1,545	980	732	523	738	1,153	946
August.....	1,452	815	724	519	738	1,504	856
September.....	1,254	817	703	772	739	1,306	712
October.....	1,294	827	710	200	997	1,313	.....
November.....	922	679	481	630	921	1,047	.....
December.....	459	711	570	530	776	754	.....
Total.....	11,711	8,506	6,418	5,284	7,078	11,030	.....

The Upper Lakes Channels.

The plans and specifications for the ship channels between Duluth, Chicago and Buffalo have at last been completed, and some idea can be obtained of the magnitude of this great undertaking. The work is to be carried out in eight sections. The first consists of the improvement of two shoals in St. Mary's River above the canal, and will require the excavation of a channel 300 ft. wide at the bottom and about 3,000 ft. long. The estimated amount of work is about 90,000 cu. yds. of boulders, clay, sand, and possibly hardpan. Bids on the section will be received at the United States Engineer Office, at Detroit until noon, Dec. 17. The second section requires the excavation of a channel about 18,500 ft. long, containing 350,000 cu. yds. of similar material to the first section, through Little Mud Lake, St. Mary's River. Bids for this section will be received until Dec. 14. The third section requires the removal of about 90,000 cubic yards of limestone rock to make a channel about 3,000 ft. long near Sailors Encampment Island in St. Mary's River. Bids on this section will be received until Dec. 9. The fourth section will require the removal of about 67,000 cubic yards of earth to form a channel 3,000 ft. long, about 1½ miles below Sailors Encampment Island, for which bids will be received until Dec. 16. The fifth section comprises the improvement of a number of small shoals at the foot of Lake Huron. The excavation will consist of about 250,000 cubic yards of earth, proposals for which will be received up to Dec. 15. The sixth section requires the removal of 950,000 cubic yards of clay and sand for the improvement of the St. Clair Flats. The channel when completed is to begin at the deep water of the St. Clair River above the St. Clair Flats canal, with a bottom width of not more than 650 feet, thence

narrowing gradually to the canal for a distance of about 3,000 feet; thence for the full width of the canal through its entire length of 7,200 feet; and, finally, widening out into a channel 17,000 feet long, and not more than 800 feet broad at the bottom, which ends in the deep water of Lake St. Clair. Bids on this section will be received until Dec. 12. The seventh section, another large portion of the undertaking, comprises the improvement of Grosse Pointe Flats, in Lake St. Clair, and is estimated to require the removal of from 1,200,000 to 2,900,000 cubic yards of earth, depending on the final width of channel required by the engineer officer in charge. The bids on this section will be received until Dec. 10. The eighth section comprises the improvement of the bar at the mouth of the Detroit River. The channel will be about 20,500 feet long, and will require from 410,000 to 1,080,000 cubic yards of earth excavation, depending on the width finally selected by the engineer officer in charge. Bids for this work will be received until Dec. 13.

A depth of 21 ft. is required in the first, second, third, fourth, fifth and eighth sections, and a depth of 20 ft. in the sixth and seventh. The side slopes are to be at the rate of two horizontal to one vertical. All excavated material is to be dumped at points designated by the United States agent in charge of the work, and the contractor for any section is required to remove all material that may be shoved or deposited in any part of the channel on which he is engaged.

Work is to begin on or before May 15, 1893. The total of the payments earned for excavation at the end of the first working season shall be at least one-fifth of the estimated cost of the entire contract; at the end of the second working season at least three-fifths of the same; and the work is to be entirely completed at the end of the third season.—Engineering Record.

Winding Arrangement for Tape Measures.

An improved but simple arrangement for winding measuring tapes is shown in the engravings. It will be seen that the handle extends to give a good leverage and is easily opened. The flush handle commonly used on steel tapes is a great improvement over the old style surface handle, but even these flush handles are objectionable, because they have to be opened by inserting the thumb nail and their construction allows only a short handle and small knob. The device shown is intended to overcome these objections.

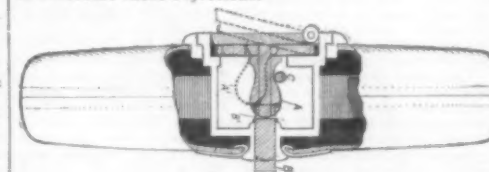


Fig. 1.

Fig. 1 shows the position of the handle and inside of winding drum when closed, also the mode of opening it. The inside of the winding drum forms the receptacle for the folding handle and knob. B shows a pin which extends one-eighth inch beyond the surface of the case, and which, by slight pressure, throws out the handle on the opposite side. A shows the handle knob when closed; A' shows it when pressing out for opening; C shows the spring which holds the knob and handle in place when closed.

Fig. 2 shows it open, ready for use. The handle, upon



Fig. 2.

opening, swings out, giving the handle double length for leverage. This construction allows the use of an extra long knob, and these features render the winding of the tape exceptionally easy and convenient. This tape is made by the Lufkin Rule Co., Saginaw, Mich.

English and American Locomotives.

The following very interesting letter appears in *The Engineer* of Nov. 18. The initials are doubtless those of Mr. W. M. Acworth, so well known to many of our readers.

Some months back, when the question of English vs. American locomotives was being discussed in your columns, I ventured to urge that though an American engine might burn more coal per pound of steam, and so appear per unit of power developed a more extravagant machine, it yet might on the whole be a more economical instrument of traffic, if its greater tractive force enabled the management to run in one train loads which with our smaller English engines require two trains. I instanced not a few train in England which had been divided simply because English engines could not haul them, and pointed out that if a railway is worth £100,000 per mile—and our great main lines are certainly not worth less—the rent of each mile of one road, for the time necessary for the passage of an extra express—say, twenty minutes—is about 2s. In other words, assuming that an English engine hauls 200 tons at a given speed

Name of company.	Train.	From	To	No. of cars.	Total weight English tons.	No. of miles.	Time allowed.	No. of booked stops.	Inclusive speed in miles per hour.	Remarks.
New York Central.	Empire State Express.	New York.	Buffalo.	5	143	440	H. M.	4	50.8	"Piloted" on bank of 1 in 70 out of Albany. Train ferried over the Susquehanna at Havre de Grace, and passengers over the Hudson from Jersey City to New York.
Baltimore & Ohio.	Blue Line Express.	Washington	New York.	4	116	226.4	5 0	8	45.3	
Chicago, Milwaukee & St. Paul.	Omaha Short Line Expr.	Chicago.	Bluffs.	6	197	467	15 5	24	32.3	This is the weight as leaving Chicago when speed is highest, as the first 250 miles are run in 7 hours—33.7 miles per hour. Into New Orleans weighs only about half.
C. C. C. & St. Louis.	"Big Four" Express.	Chicago.	Cincinnati.	6	197	305.6	8 45	21	34.8	
Illinois Central.	Chicago & New Orleans "Limited"	Chicago.	New Orleans	9	253	915	29 30	41	31	Passengers ferried over Hudson from New York to Jersey City. This is the weight as leaving Jersey City. For 320 miles of total distance the weight is 20 tons less than this. For 148 miles it is 22 tons more. Weight leaving Chicago, reduced by 40 tons at Bloomington, 120 miles.
Chicago, Burlington & Quincy.	Burlington Express.	Denver.	Chicago.	8	256	1046	28 15	27	37.2	
Pennsylvania.	Vestibule Express.	Chicago.	Minneapolis	6	183	442	14 5	14	31.5	Train ferried over Detroit River, and stopped at Niagara for passengers to see the Falls. Weight given as leaving Chicago, but cars are taken off and put on at many intermediate points.
	Chicago Limited	New York.	Chicago.	6	230	912	21 45	11	36.9	
Chicago & Alton.	Kansas City Express.	Chicago.	Kansas City	9	315	488	14 30	20	33.66	
"	St. Louis Express	Chicago.	St. Louis	4	139	281	8 10	10	34.4	
Michigan Central.	North Shore Limited.	Chicago.	New York.	9	375	976	26 25	26	37	

with 30 lbs. of coal, and that an American engine burns—or blows out of its smokestack unburnt—80 lbs. of coal with a 400-ton load at the same speed, the American engine is, on the whole, a much more economical traffic instrument than the English, for though it spends 1d. per mile extra on coal, it economizes 2s. per mile in rent of road. Of course, this argument of mine only applies where roads are so full of traffic that increase of train mileage means increase of accommodation in stations, sidings, relief lines, etc. But then all our great lines are practically in this position at the present moment, while not a few single lines are declared to be in urgent need of doubling.

This contention of mine you have traversed in various ways, but in particular you asserted that American passenger trains were not heavier than ours, and produced in support of your assertion some figures as to the average weight of passenger trains in the two countries. With those figures I have no wish whatever to quarrel, but they are beside my point. The average passenger train in America is small, because the average number of passengers is few. But at certain hours certain trains are heavy and full, because many passengers then wish to travel; and in America, with their powerful engines, the superintendent adds to the length and weight of such trains long after the point where his English colleague would have been compelled to divide his train.

The proof of the assertion is, I think, to be found in the table which follows, and gives, as I believe, a fair sample of American practice. The material for it has just reached me from America. Its accuracy may, I think, be trusted, as the weights have been in every case authenticated by the signature of the master mechanic of the road in question. The weights are, I would say, given in English tons, and are those of the train, exclusive of engine and tender, and with no allowance for the weight of passengers or their baggage, and they are those hauled in ordinary everyday practice on the trains mentioned by a single engine.

In comparing these performances with those on English railways it is to be remembered that, with the exception of the Empire State express, and I presume of the Blue Line express, as to which I cannot speak for certain, all the trains have to run over a single line for a great part, if not the whole, of their journey; that what, with unfenced tracks, drawbridges, grade crossings, meeting and passing freight trains, absence of signals, and so forth, innumerable slacks and stops have to be made, which are not shown in the time-tables, and which have no analogues in England, so that, on the whole, even 31 miles an hour means a very high intermediate speed. It is safe to say that none of these trains could keep time unless their engine could take them under favorable circumstances at the rate of 60 miles an hour.

minutes between Perth and Kingussie. The American train keeps time with a single engine. But I need not argue that no English express ever weighs anything like 375 tons. It is enough to say that this weight would be more than 18 Northwestern or Great Western eight-wheelers, which would be registered at Euston in the guard's journal as "equal to 27," and at Paddington as "equal to 36." I will not attempt to say what English speeds are; your readers probably know as well as I do; or, if not, can find them for themselves in "Bradshaw," or in "Oxwell and Farrer's" "Express Trains, English and Foreign;" or even, if they will make the necessary corrections of our hopelessly inaccurate Board of Trade railway returns, in the recently issued "Return of Fast Trains." As for weight, I shall not, I think, be contradicted if I say that the crack English expresses, the day "Scots" on all three roads, the Great Northern 9:45, 1:30 and 2 o'clock, the Midland "John Nobles," the Cheshire Lines 40 minutes Liverpool and Manchester expresses, the "Dutchmen" and "Zulu," and such like trains, weigh about 100 to 120 tons, 150 being quite their maximum; that trains of second class speed, such as the Irish mail or the 10:10 a. m. ex Euston, reach about 230 tons with a single engine over good gradients; that night mails may on occasion rise even to 250 tons or thereabouts—the 8:45 a. m. ex Brighton used to reach this in the old days on a Monday morning; but that a 300-ton express is practically unknown, even over a line as perfect as that of the Great Western or the York & Darlington section of the North-Eastern.

One remark more. Most of these American expresses, though they run very long distances, stop every 30 miles or so, as the volume of traffic "out West" will not pay for "pick-up" trains to collect passengers in front of the crack express. If our English comparison is to be fair, we must take the time, therefore, of the "Cornishman," for instance, not to Plymouth, but to Penzance; of the Great Northern and Sheffield expresses, not to Manchester, but to Liverpool; of the 8 p. m. ex Euston, not merely to Perth, but to Inverness, if not to Strome and Wick. Putting it all together, of course our speeds are higher than anything except the very cream of American expresses. But no one surely will deny that the work done by the engines of the trains I have cited is wonderfully fine. I may, of course, be told that engines to do such work are not wanted in England. It may be so; but before I accept such an answer as final I should like to know what a traffic official—say the man who has to work the trains through Crewe between one and three on an August afternoon, or along the single line of the Cambrian to Barmouth before a bank holiday—has to say on the subject.

W. M. A.

The Metropolitan Double-Tube Injector.

The locomotive injector shown in the engravings, in perspective and in section, is an improved form recently

not necessary for an engineman to look out of a cab to see whether the injector is feeding or the water escaping from the overflow.

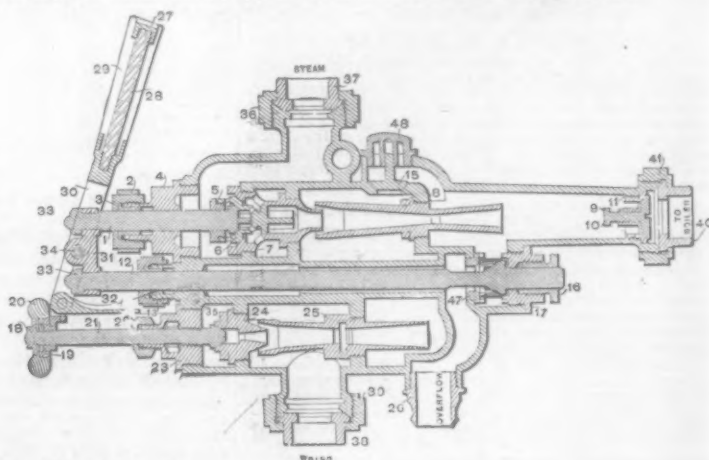
The sectional view shows all of the parts so clearly that description is not necessary. At 6 is shown the steam valve, and the parts relating to it are numbered 1 to 5. The forcing steam tube is shown at 7, and the combining tube at 8. At 10 is shown the line check valve. The overflow valve stem is shown at 12, and the valve and its seat and other parts at 16, 17 and 47. The regulating valve wheel is shown at 20; 24 and 25 show the lifting steam tube and combining tube.

These injectors were first placed on the Central Railroad of New Jersey about a year ago, where they have had a very thorough and complete test, and are said to give good satisfaction under all conditions. All the compounds on that road are equipped with this style of injector, and that duty is a severe one for an injector. We are told that the engineers have found in running these injectors on the compounds that the capacity can be reduced nearly as well at 180 lbs. as it can at 125 lbs.

Another important feature claimed for this injector is that the capacity steadily increases as the steam pressure increases. For instance with 125 lbs. steam pressure the No. 9 injector has a capacity of 2,900 gallons of water per hour. With 150 lbs. steam pressure this capacity is about 3,000 gallons of water per hour, and with 180 lbs. of steam pressure it is about 3,075 gallons of water per hour. These injectors will start with 25 lbs. steam pressure, and without any regulation the steam or water supply will work at all steam pressure up to 250 lbs. It is found that with 100 lbs. steam pressure these injectors will take water at 145 to 150 degs. Fahr.; with 150 lbs. steam pressure, they will take feed water at 135 degs. Fahr., and 180 lbs. will take it 125 degs. Fahr. The independent lifting and forcing apparatus permits easy and close regulation of the capacity, and owing to this apparatus these injectors are strong lifters, and no matter how hot the injector or suction pipe may become, the injector will promptly lift the water. In the most severe test it has been found that it never requires over 30 to 40 seconds to bring the water, even after the injector has been used as a heater for some time.



Metropolitan Double-Tube Locomotive Injector.



The New Barr Vestibule.

In the *Railroad Gazette* of July 17, 1891, we illustrated the vestibule patented by Mr. J. N. Barr, Superintendent of Motive Power of the Chicago, Milwaukee & St. Paul Railroad, which has been in successful use on several roads. Mr. Barr has now invented another vestibule, which is a marked departure from those heretofore in use, as will be seen by referring to the accompanying engravings. The flexible connections of canvas or rubber which have been ordinarily used are dispensed with and in place of them a jointed, wooden connection is used.

Instead of the double folding door, one door of the full width of the platform is used, and the space from door to door is considerably wider than in other de-

Now for a word as to what these weights and speeds mean, even without all allowances, when compared with those in England. It will be observed that the lightest train shown, the Empire State express, is faster, not only than any long distance train running in England at the present time, but actually than was either West Coast or East Coast express at the time when they ran from London to Edinburgh in eight hours. And the weight of the Empire State express is 143; the trains of the two English companies weighed 80 and 120 tons respectively. The English trains, moreover, ran in August. The Empire State kept time like clockwork all through last winter. Now look at the other end of the list, at the North Shore Limited. On the Highland Railway all things are possible, and I have heard of a Highland express with "30 on," weighing, that is, something like the normal weight of the American train. But the Highland express left Perth with two engines in front and took on a third behind at Blair Athol; and it lost, moreover, 52

put on the market by the Hayden & Derby Manufacturing Co., of New York. The construction of the apparatus is simple. There are no outside attachments to become broken or interfere with placing the numerous attachments necessary in a cab. The tubes are all removed from the back end of the injector, and can be taken out without taking the injector off the engine. The valve seats are independent of the body casting and can be easily replaced or reground. This latter feature is a particularly good one, as there is no necessity to put the body casting in a lathe to turn up the valve seats. The overflow valve stem is attached rigidly to the steam valve stem, and when the injector is working the overflow is closed and the valve held to its seat by boiler pressure.

Water cannot then run out of the overflow and it is

signs. Fig. 1 is a sectional plan, showing one-half of the vestibule in connection with a Miller platform and buffer. The details of the flexible connections are more clearly shown in fig. 2. It will be seen that there are two hinged joints, both of which are on the platform end timber. The vestibule is mounted so that the face plate inclines outward or overhangs about half an inch at the top. The face plates of two adjoining vestibules are thus kept in contact by gravity instead of by springs or by a combination of levers. The only rubber used is a small strip to cover the joint at the outer hinge.

Another interesting feature is an end window in the vestibule which is covered with fine wire netting and

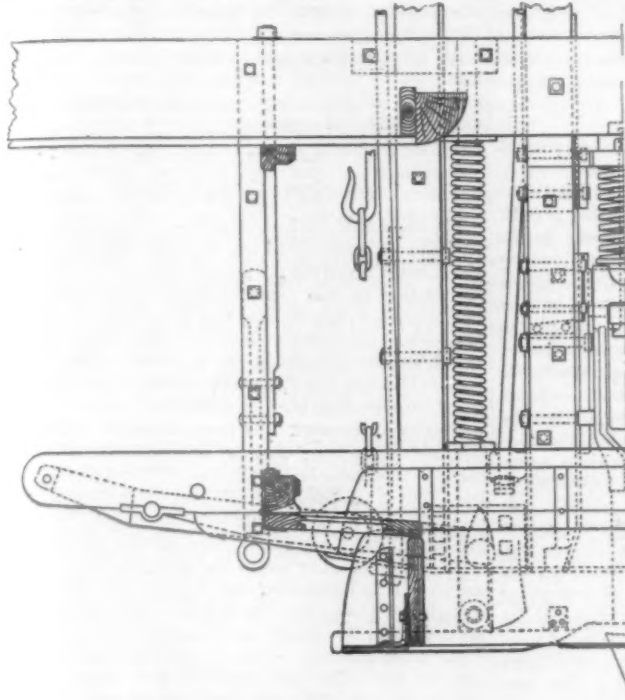


Fig. 1.

can be used for ventilation, which will be recognized as important in vestibule trains.

This new vestibule has been running on a train between Chicago and Milwaukee for three or four months and has given satisfactory results.

The advantages claimed for the new design may be summarized as follows: Making use of the force of gravity for holding the face plates in contact instead of using overhead springs or a combination of levers; the doing away with canvas or rubber diaphragms; the broadening of the space between the posts, making the whole width of the platform available and permitting the use of an ordinary coach door for the vestibule in place of the folding doors heretofore used, and the introduction of the ventilating slide or window. The Drexel Railway Supply Co., of Chicago, is agent for both types of the Barr vestibule.

Intercontinental Railroad Survey.

The commissioners appointed to represent the United States on the International Railway Commission, which has had charge of the surveys for the proposed Pan-American railroad, have presented the following report, which we have condensed slightly, of the progress made by the surveyors sent out by the United States Government.

Since the last report, May 5, 1892, the preliminary survey to ascertain the practicability of building a railroad to connect the United States of America with the Argentine Republic has gone steadily forward, gratifying progress having been made, and the feasibility of a road from the shores of the Caribbean Sea to the frontier of Bolivia demonstrated. The three surveying corps sent into the field in April, 1891, have continued their work—corps No. 1 in Central America, corps No. 2 in Ecuador and Colombia, and corps No. 3 in Ecuador and Peru. Corps No. 1, under Lieut. M. M. Macomb, U. S. Army, has finished the preliminary survey of Guatemala, embracing that section of the country between the highlands and the Pacific Ocean, and is now engaged in a topographical examination of Salvador. Of the three lines run in Guatemala, two are pronounced good by the engineer in charge, preference, however, being given to the one skirting the foothills and passing through the coffee belt. On the lower line, via Ayubla, Escuintla and Platanar, no serious engineering difficulties present themselves. Still, this is not regarded as the best location, owing to the absence of population and products. The line along the base of the foothills and running north of Mazatenango, Santa Lucia and Escuintla is therefore deemed the best, as it would drain a fine country now being developed and afford a large local traffic by reason of the coffee, sugar, rubber and fruit trade. Besides the careful instrumental lines run as indicated above, a reconnaissance of the mountainous region near the Mexican boundary, embracing the head waters of the Cuicilo, has also been made, and an interesting report thereon received. Tracings of the lower line from Ayubla to Escuintla are already on file in the central office at Washington. Corps No. 2, under Mr. William F. Shunk, has continued its survey through Colombia. In our last report the details of the work were given as far as Cali, which is 490 miles by the Guit-

ara route or 530 miles by the Tuquerres route from Quito, the starting point. From Cali, for the main route to Panama, a line has been carried along the Cauca Valley via Cartago and Manizales to Antioquia and Cañas Gordas, on the River Suño, a tributary of the Atrato. Starting from the junction of the Poblano and Cauca rivers, another line has been surveyed through Medellín to Cartagena, on Caribbean Sea. The distance of 124 miles between Cali and Cartago is without serious obstacles to cheap construction, a bridge 450 ft. long being required over the Cauca River near the former point; and with the flood waterways necessary the division from Cali to Palmira would be more expensive than that from Palmira to Cartago. An approximate estimate places the 440 miles (708 kilometres) from Quito to La Balsa crossing of Cauca River, south of Cali, at \$32,000 per mile (\$20,000 per kilometre) for grading, masonry and bridges; thence to mile 487 (kilometre 784) to Cali, \$16,000 a mile (\$10,000 a kilometre); and thence to mile 611 (kilometre 985) at Cartago, \$13,000 a mile (\$8,000 a kilometre). From Cartago to the mouth of the P. blanco, about 100 miles (160 kilometres), the cost is estimated at \$32,000 a mile. From the mouth of the Poblano, 711 miles (1,145 kilometres) from Quito, or from the Cauca river, at the mouth of the San Juan, 20 miles downstream from the former point, a branch to Medellín would be feasible, the length of it the same by both lines, namely, about 46 miles. From the mouth of the Rio San Juan the main line descends the Cauca Valley on its western slope, over ground alternately bluff, bench and bottom, cloven by frequent streams, 50 miles (80 kilometres) to the City of Antioquia, 781 miles (1,257 kilometres) from Quito. Thence it develops up the valleys of two streams to a tunnel 2,500 ft. long, and thence descends to Cañas Gordas, 35 miles from Antioquia, or 816 miles from Quito. The estimated cost of construction from Poblano to Antioquia would be \$24,000 a mile; the extension to Cañas Gordas, \$48,000 a mile. On Aug. 26, 1892, corps No. 2 was reunited at Cartagena, the distance surveyed from Medellín being 373 miles, and the average estimated cost of construction \$22,500 a mile. Timber for ties, stone for masonry and water are found on or near the line throughout its length. In addition to the above, satisfactory explorations of several passes through the cordillera, in the direction of both Bogotá and Panama, have been made, and finished maps of the region as far as Medellín have been received in Washington. Mr. Shunk is about to transfer his field operations to an José de Costa Rica, whence he will

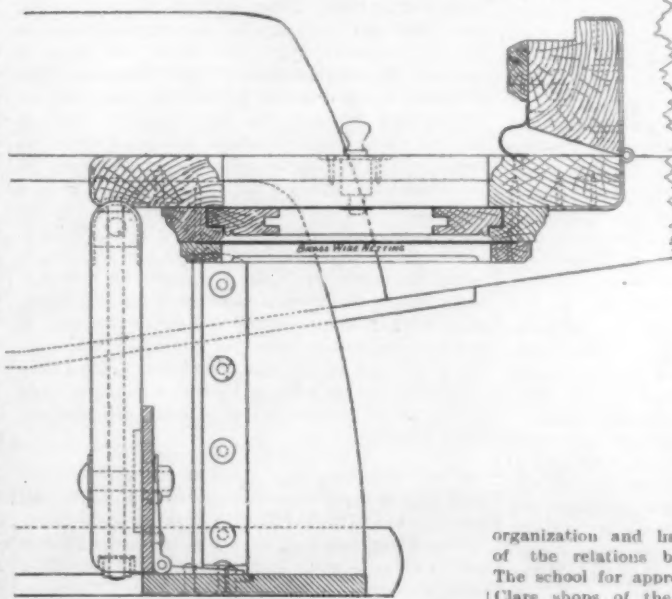


Fig. 2.

The Improved Barr Vestibule.

work southward, reaching the Isthmus of Panama at a season suitable for field work, and endeavor to make connection with the line already run to Cañas Gordas.

Corps No. 3, under Mr. William D. Kelly, has finished the preliminary survey of Peru. In our last report the progress of the work of this corps was brought down to the time of its arrival at Cerro de Pasco. Leaving that point on April 18, 1892, a careful instrumental survey was conducted via Oroya, Jauja, Huancayo, Ayacucho and Abancay to Cuzco, a distance of 403 miles; thence an examination was made over the line of the Mollendo and Arequipa Railroad to Puno, on Lake Titicaca, on the frontier of Bolivia. The corps left Puno on July 27 and reached Washington on Aug. 30, 1892, and are now engaged in the completion of the map work and in the preparation of other data collected in Ecuador and Peru. In the section between Cerro de Pasco and Cuzco the elevations on the preliminary line as actually run vary from 5,800 ft. above sea level to 14,723 ft., Cerro de Pasco having an elevation of 11,233 ft. and a population of 8,000; Jauja, 11,145 ft. with 12,000 inhabitants; Huancayo, 10,635 ft., with 20,000; Ayacucho, 8,900 ft., with 40,000; Abancay, 7,853 ft., with 7,000; and Cuzco, 11,003 ft., with 60,000 inhabitants. Owing to the numerous ridges and deep intervening valleys in this section, maximum gradients and curvature with considerable development would be required, making the cost of building expensive, probably over

\$40,000 a mile; still, there are no insuperable obstacles to be overcome, and the construction of a railroad is therefore perfectly feasible. On or near the proposed line between Quito and Cuzco (1,480 miles) there is a population of 600,000 occupying a country very rich in natural resources. Numerous courtesies were extended to corps No. 3 by the Peruvian Government. A cavalry escort was furnished for a portion of the route believed to be infested by hostile Indians and receptions tendered the engineers at several places, but most notably at Arequipa and Lima.

The practical result, up to date, of the labors of the Commission in South America is the demonstration by actual surveys in the field of the practicability of construction of a railroad from the shores of the Caribbean Sea to Lake Titicaca, on the western boundary of Bolivia. This line of over 2,800 miles in extent, running through the three states of Colombia, Ecuador and Peru, each with untold natural resources as yet barely touched, although in some sections encountering physical obstacles that will require the use of maximum gradients and considerable development, is entirely feasible throughout, and in the main of comparatively easy construction at a moderate cost, especially so when we consider that it traverses the great Andine plateau, in which physical difficulties were to be expected, but in which, however, are located the most populous towns and the most thriving industries of the region, as well as the richest mineral and agricultural lands.

Since our last report the following sums have been contributed toward the enterprise: Fifteen thousand dollars by Brazil, \$1,000 by Costa Rica, \$1,000 by Ecuador, and \$65,000 by the United States. This latter was accompanied by a proviso that this sum shall be in full of the share of the United States for the expense of the preliminary survey. While it is believed that the preliminary survey of the main line can be completed with the money now on hand and expected from the South American countries, it is not probable that there will be funds sufficient for the proper preparation and publication of the valuable material collected concerning the natural and developed resources of the countries traversed and the engraving and distribution of the necessary maps exhibiting the character of the regions examined. Messrs. A. J. Cassatt, H. G. Davis, and R. C. Kerens are the delegates on the part of the United States who sign this report.

Discipline on the Chicago Elevated.

The Chicago & South Side Rapid Transit Railroad Co. is preparing to assume the management of its property (all operations having been hitherto carried on by the "Rapid Transit Bridge & Construction Co.," which built the road), and a circular giving the rates of wages and defining the policy of the company toward employees has been issued by President W. T. Barnard. This circular is a model of its kind, and we therefore print below the more interesting portions of it (except the rates of wages, for which we have not the space). The hours of duty vary from 8½ to 12 hours a day. Enginemen and firemen will work eight hours and 15 minutes a day. Other trainmen, dispatchers, track men, machinists, etc., will generally be required to work 10 hours a day. Road foremen, roundhouse foremen and men employed in the roundhouses, gatemen and platform men will be required to work 12 hours. Day ticket sellers are scheduled at only seven hours a day, and night ticket sellers 10 hours. The rates of pay appear to be liberal, and overtime will be paid by the hour, as is usual on other railroads.

Dr. Barnard was assistant to the President of the Baltimore & Ohio before the reorganization of that company some five years ago. He has a singular capacity and taste for organization and has been a philosophical student of the relations between employer and employee. The school for apprentices established at the Mount Clare shops of the Baltimore & Ohio in 1885 was to a great extent planned and organized by him. Whether or not the original idea of that scheme was his we do not know, but the lines on which it was developed were laid down by him after a very careful study of the subject at home and abroad. It was the idea of that school to train up a body of young men as the working force of the Baltimore & Ohio Railroad primarily, and also to fit them to fill positions on other railroads. These pupils were chosen preferably from the families of the employees of the Baltimore & Ohio, and they were divided into classes, the instruction in which varied somewhat according to the positions that the pupils appeared to be best fitted to fill. Thus young men were to be trained for the administrative departments as well as mechanical and operating departments. The misfortunes of the Baltimore & Ohio prevented carrying out this extremely interesting experiment on the lines laid down by President Garrett and Dr. Barnard; but the knowledge acquired in the preparation of that scheme and the breadth of view developed have undoubtedly had an influence in the formulation of the plan which is developed in this order, which, it is to be noted, is not mere theory, but is the result of a careful study of actual conditions.

(Continued on page 905.)



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Those who read closely the discussion of the report on switch stands, made at the Atlanta meeting of the Roadmasters' Association, will doubtless have noticed that some of the speakers suggested a target showing only danger; that is, one showing its edge, and therefore practically invisible, when the main track is clear. At night the light would be invisible. One gentleman said that the New York Central is going back to the use of the "single" target, and that there is no use of showing anything when the track is clear. We should like to emphasize a principle that underlies all correct signaling, which is, that the clear signal should be positive. Showing a positive signal for danger is very important, but at a switch it should be a secondary point. The absence of a signal or the appearance of anything but the established safety signal should mean danger and compel a stop. Of course this principle has been reiterated a great many times since people began to lay down any set rules for signals, but it cannot be repeated too often, for it is frequently forgotten by men of much greater pretensions than the roadmasters. Another fact should be borne in mind by those who speak of the New York Central precedent. All facing point switches on the main line of that road are protected by semaphore signals, placed at a considerable distance in advance of the switch. This fact makes the use of a target at the switch a matter of convenience, chiefly. We notice that one speaker at the meeting spoke of the confusing effect of a large number of white switch lights in a yard. We hope that all who realize the magnitude of this element of danger will be careful to note the Chicago & Northwestern practice, which was also mentioned. This practice—green for "all-clear"—affords an effectual remedy for the difficulty mentioned.

Continued experience with the Johnstone compound locomotive shows that the economy indicated by the recent tests published in the *Railroad Gazette* is found in regular service on the Mexican Central. Recently these engines have been fitted with tapered valves; that is, the outside lap is greater at the ends than at the centre of the valve. In this way steam is admitted slowly, and the pounding common to four-cylinder compounds is reduced considerably. The pound referred to here is that which takes place when the engines are working steam full stroke. The steam is discharged from the high-pressure cylinder into the low pressure suddenly when the valve of the low-pressure cylinder opens; this results in the reversal of the pressure on the piston rod of the low-pressure cylinder at about the same time a reversal of pressure occurs on the high-pressure cylinder piston rod, with the result that the slack in the connecting rods is taken up suddenly, causing a pound. By admitting steam into the low-pressure cylinder at the centre of valve through a small opening made by the tapered face of the valve, the increase of pressure is made so gradually as to prevent

pounding. On the Mexican Central it has been found that one of the advantages of a compound locomotive, and one that should be credited directly to compounding, is the high maximum power in the engine when it is working high pressure. There are points on many roads where, if an engine cannot take a full train over a short grade, it is necessary to "double," that is, to cut the train in two parts and haul the parts over separately. This causes a considerable loss of time. But with the compound, by running the engine less economically and letting steam from the boiler directly into the low-pressure cylinder, the engine can haul the heavy train over the hill without "doubling." The result of this is to increase the amount of work done per month. Of course, on some lines it is not possible to reap this advantage from the compound engine; but on roads having short and heavy grades the compound has the advantage mentioned.

A collision occurred the other day in consequence of a mistake in giving or understanding the whistle signal for calling in a flagman. It was on a prominent road and one of the trains was an express, carrying esthetic passengers in esthetic cars, so that the damage to the reputation of the road was probably fully as serious as that to the locomotives and cars, although no passenger was hurt. A mistake of this kind is of interest, because that whistle signal rule has caused trouble before. In 1889 eight passengers were killed where a brakeman took in his red light in response to a signal which the engineman says he never sounded. In the case we now speak of, the engine (freight) was switching on the main track. Just about the time when the flagman should have been called in it became necessary, in consequence of some unexpected complication, to signal a switch tender a little distance off. This was done, according to the standard code, by four short blasts of the whistle. But the switchman was not alert, and the signal was given a second time, and the engineman, using his own judgment instead of following the rule, tried to emphasize the signal by making it louder and longer; but this converted it into the flagman's signal, and the flagman at once covered his flag, letting the express train pass him. One way to remove this danger would be to abolish the switchman's signal, or to permit its use only with a mouth whistle or tin horn. After the men became familiar with their use these smaller instruments would be effective in nearly every case where the signal is needed. The only serious objection to their use is the additional care involved in introducing one more appliance and keeping the men supplied with it. Any one riding on a train which is stopped much between stations will see the desirability of abolishing the four-short-blast signal for the steam whistle, if it be a road where the flagging rule is followed even passably well. A passenger engineman, who has been told not to disturb people with unnecessary noise, and who has to call in a flagman several times on a single trip, very naturally decides that there is no necessity for long blasts, and so will give short ones, and thus violate the rule. It seems to him to do no harm, but it is fatal to the integrity of the code, for the brakeman learns to put a loose construction on the rules, and is thus encouraged to do what he thinks is right, instead of doing just what the signal tells him to do.

If the four-short-blast signal is not abolished the plain duty of every superintendent is to know that his men are alive to the necessity of making short blasts short and long ones long, even if he has to get a music teacher to take them into a desert and put them through a course of two-hour rehearsals. We have much better discipline than a few years ago but there is room for very great improvement yet. We still trust too much to the engineman's intention, glibly expressed when he is being examined, to do everything exactly according to rule. As we recently had occasion to remark, the best runners are those who have had the most experience crowded into the shortest time, and to secure this experience for new men where the ordinary service does not afford it, they must be put through preliminary drill, as soldiers are drilled in camp before going to war. The youngest runner just "set up" from a switcher has, in many respects, more important responsibilities than the old man on an express train, and it is not safe to wait for him to learn by slow experience. Many superintendents who do not directly answer the allegation that their enginemen are not thoroughly trained, make an indirect answer by expatiating on the importance and value of interlocked signals and other mechanical safeguards, and their determination to increase the number of these. With proper home and distant signals, the collision we have spoken of above need not have occurred, as the flag would then have been merely an extra precaution instead of a vital protection. But that answer does not answer; too

much time is required for its fulfilment. Thousands of enginemen must run many years yet without sufficient fixed signals. And the final and most sweeping argument in favor of a general increase in thoroughness in training enginemen is that the outlay will be well repaid, whatever service the men may be placed in. Habits of alertness, regularity, delicacy of touch, care in reading instructions and so on, are worth all they cost even where all the mechanical accessories and safeguards are supplied. Instead of providing machinery to take the place of well-trained minds the aim should be to have the best machinery and the well-trained minds. And probably the last will be found in many cases more readily obtainable than the first. Of 100 enginemen five can be picked out who in one year could tell the other 95 how to improve themselves wonderfully; but it would take five years to get the money to pay for all the safety appliances necessary to get along with 95 dull enginemen.

Commissioner Veazey's Decision.

The decision of the Interstate Commerce Commission on the cases presented by the Georgia State Railroad Commission involving the general question of the interpretation of the fourth section of the Interstate Commerce law, was summarized in our news columns last week. The decision itself contains about 30,000 words, and the pamphlets are sent out labeled "Important Decision," etc., the idea of importance being based apparently on the fact that a new commissioner has reviewed the work of all his predecessors, aided by the light of five years' observation of the attempts of the railroads, more or less effectual, to comply with the law. But it can hardly be said that the importance of the decision is commensurate with its length. Commissioner Veazey has made a very careful and thorough study of the law and of the whole history of long and short haul legislation, but he has not presented enough new phases to tempt the busy railroad manager to follow him through his 38 pages.

The most essential point decided is that a railroad must not decide for itself that it is not subject to the prohibition of the long-and-short haul clause except in plain cases. This inhibition is set forth with more particularity than it has been before, but it is clearly intimated that the commissioners will be disposed to give full weight to the arguments of the railroads, if they apply for leave to make exceptional tariffs. This appears in the ninth paragraph of the syllabus. The gist of the opinion on this point is that the railroads may in many cases make low long-haul rates after getting leave from an impartial investigating tribunal (The Commission), but not without such leave.

To the railroads interested the main question was important, but it is decided practically against their views, and they will probably take some way to get it before a high United States Court. Indeed this, as we understand it, is the very question which they have already decided to make the subject of such an appeal, as announced by Gen. E. P. Alexander in an article published in the *New York Independent* Oct. 6 last. Writing on the general subject of the justice of a higher charge for a shorter haul, he takes this case (or one of these) as an illustration. Carriages shipped from Cincinnati to Chattanooga are carried at normal rates, to Atlanta at low rates, to Augusta, Ga., at very low rates and to Charleston at about cost. This arrangement is necessary to get the business, because carriages made in New York and eastern cities go by water (and also by rail) down the Atlantic coast and compete with the Cincinnati carriages. At Social Circle the competing rates from the east and from the west meet each other, and a case was made there and taken to the Georgia Railroad Commission which decided that the roads must not charge less from Cincinnati to Charleston than to Social Circle.

There is nothing new to say on the subject, of course. A railroad can often make money by carrying, at rates barely above cost, competitive freight which it could not get at tariff rates, and thereby increase its net earnings so as to finally reduce the local rates for the very people who complain because the consignees of the low price freight seems to be unduly favored. But public opinion has practically compelled the railroads to adopt the principle of the long and short haul law in a good many cases out of respect for the sentiment that requires the abolition of this seeming injustice, and the only question for the Supreme Court to decide will be how far this sentiment shall be allowed to govern. Whether it will be practicable to prescribe any limits at all for general application remains to be seen. The fact that it is only a matter of sentiment does not make the question unpractical, for no one of us dares to say that he will be governed by pure "business" and nothing else; but if the courts cannot

do any better than the Interstate Commerce Commission has done—and probably they cannot—toward fixing a compromise between sentiment and business, the law will fail, and business and sentiment will have to continue to fight in this as in many other affairs of life. It is right that sentiment should rule in this matter, in many cases, for the railroads often make a mistake which weakens all their arguments. In making rates close to cost to get competitive freight, they shave so close that they either lose money absolutely, or make so little that only the next generation of the local patrons gets any benefit from it. There is no use in trying to make the public take such far-sighted views as that requires. The railroads are too prone to take short-sighted views themselves. And a railroad which actually increases its income in this way to an appreciable extent is likely to spend the increase on some object which is right in itself, but which appears to the public as wasteful, and the result is, simply, more dissatisfaction. If a Georgia railroad, which makes \$1,000 in carrying buggies at rates which the public not enjoying them regards as ruinous, could spend that identical thousand in building a new station for that complaining community there might be some hope of justifying the transaction; but that is entirely out of the question, of course; and so, as we have said, sentiment must sometimes govern. Sentiment is invoked to get people to encourage the building of a railroad and the railroad man must be content if they continue to demand the employment of the same principle in the operation of the road.

The secondary questions embraced in Commissioner Veazey's nine points, as stated in the syllabus, are decided in accordance with common sense, but some of them have been hazy ever since the law was passed, and they remain hazy still. In the second paragraph there seems to be some doubt about what a "common arrangement" means. Railroads never send freight on through way bills without first agreeing to do so. Whether this agreement is formal or informal would seem to be immaterial. We do not find any facts in the report to explain this part of it, but the Commission probably intends to decide that where one road makes a through rate by using the second road's tariff without asking its consent, the shipment comes within the law.

Doubtless it is interstate traffic, but the question of "common arrangement" is another matter. The opinion says that the "arrangement" is complete whenever the carriers have arranged for delivering through traffic to each other. But the trouble with this reasoning is that the roads often do not make any arrangement for delivering traffic to each other. They treat each other the same as they treat the public. It is doubtless true that a shipment carried from New York to Buffalo by the New York Central, destined for Cleveland, is interstate traffic from the moment it starts, even if the Central makes no through rate and does not deliver the goods to the Lake Shore at Buffalo until the latter road, or an independent drayman, calls for them at the Central freight house; but the Lake Shore or any other road in like circumstances would probably resist the application of the law to the local rates in any such case if the point were of enough importance to justify a fight. In fact it was decided in the case of *Crews vs. Richmond & Danville* in 1888 (decision by Chairman Cooley) that a road is not responsible for rates made by a connection without agreement. If we try to apply the Interstate Commerce law to rates in a case like this it results practically in an attempt to compel a road to make joint rates, which, as was shown in the *Little Rock & Memphis* case in 1889, cannot be done under our law.

The eighth paragraph of the syllabus is the principal one. It emphasizes the point that when competing with a line wholly foreign, as from Montreal to San Francisco over the Canadian Pacific and Pacific steamers, an American road may decide at once for itself that it is not subject to the fourth section. The present opinion says that this view is practically the same as that set forth in the *Louisville & Nashville* decision five years ago. But that decision said that such circumstances may warrant the ignoring of the prohibition in the law; and the railroads generally felt, from Judge Cooley's other utterances, official and unofficial, that a low through rate for the purpose of competing with a Canadian road would probably be condemned by the Commission. At any rate, American roads have complained considerably because they could not meet Canadian competition. This has been partly disingenuous, however, for the Canadian roads have in many cases taken freight at such low rates that the American roads did not desire to compete if they could. The technical point of the law against them probably is that, in carrying freight, say, from St. Paul

to Boston, the Canadian Pacific is subject to our law. Here comes in the decision of Judge Allen in the United States District Court at Springfield, Ill., last February, in the case against Milton Knight, holding that our laws have no effect on transactions in Canada, and that the consent of a Canadian road to abide by our laws does not cure the defect of our jurisdiction. The theoretical jurisdiction over rates from St. Paul to Boston through Canada amounts to nothing if the practical situation nullifies it. Again, the decision that an interstate road, say, from Atlanta to Savannah, may disregard the fourth section, because a competitor carries freight between the two points without going out of the state, is of questionable value because it has been decided in the case of the *Lehigh Valley* against the state of Pennsylvania (decided by the United States Supreme Court last May), that such traffic is not Interstate even if it be carried across the soil of another state.*

But it is futile to follow out these fine points concerning the meaning and application of the fourth section, as is apparent when we consider that this section is essentially only a detail of the second section, which practically forbids a higher charge to A than to B for any like service. Thus the case against the Texas & Pacific, decided by Judge Wallace in the United States Court, at New York, Oct. 5, places the Interstate Commerce Commission in a position where it apparently contradicts itself. That road, in carrying Liverpool freight from New Orleans to El Paso at lower rates than New York freight (both bound for San Francisco), violated the fourth section, but under circumstances which the Commission explicitly says in the present decision do justify the road, the competitor being entirely outside the Commission's jurisdiction. But the road was ordered to withdraw the low rate, nevertheless; and Judge Wallace's decision sustaining this order of the Commission is based on the second section. He holds, practically, that the discrimination against New York shippers, on the evidence as gathered and stated by the Commission, is so flagrant that it should be stopped. The only reasoning offered by the Judge is that to permit such great variation in rates would nullify the Interstate Commerce law. Perhaps it would, but possibly these provisions of the law which are so hard to apply may cause so much trouble that we shall all wish they had been nullified.

Traffic Associations Not Prohibited by the Anti-Trust Law.

As we go to press the telegraphic announcement comes that Judge Riner of the Federal Circuit Court at Topeka, Kansas, has decided the case which the United States Government brought to restrain the Trans-Missouri Freight Association, from carrying out the objects of its organization and to compel its dissolution. The action was brought on the theory that the Association was an illegal combination and contrary to the provisions of the Act of Congress known as the Sherman Anti-Trust Law, of July 2, 1890. The Association was composed of the principal railroads west of the Missouri and east of the Rocky Mountains, and like all the other traffic associations, was formed for the purpose of adjusting freight rates on a satisfactory basis. The points involved were, first, whether the agreement was contrary to the anti-trust law; second, whether the corporations constituting the association had surrendered any of their franchises by joining it; and third, whether the anti-trust act applied to associations of this character or to common carriers at all. The act pronounces illegal every contract in restraint of or monopolizing trade or commerce among the several states or with foreign nations, and visits with heavy fines or imprisonment, or both, persons convicted of the offenses prohibited. Common carriers are not mentioned in it, but the language employed is quite broad enough to include every scheme or combination prohibited, whether by a common carrier or any corporations or natural persons.

The railroads contended that their association was not a trust, nor did it operate to restrain trade or constitute a monopoly, and they called attention to the fact that the Interstate Commerce Law had been enacted for the purpose of conferring special jurisdiction and control over common carriers. These views the Court adopted and the contention of the roads, as indicated, appears to have been sustained throughout. Judge Riner held that there was nothing unlawful in the contract of association and that the provisions of the Act in question do not apply to common carriers.

* On this point Commissioner Veazey calls attention to the fact that the Georgia State Commission, complaining in this case of the violation of the long and short haul section of the National Law, has expressly authorized the suspension of that rule on a road within its own jurisdiction.

The Trans-Missouri-Association has now gone to pieces from its own inherent weaknesses, and this decision is therefore of interest only as a bearing on the abstract principle; but on the merits, we can see nothing in a mere freight traffic association that is necessarily unlawful or fraught with the least possible danger to the public. On the contrary, such arrangements may and are carried out with great benefit to the railroads and the public. Even assuming that Judge Riner is in error in deciding that the Act does not apply to common carriers, which strikes us as the weak point in his decision, the Act does not prohibit traffic associations in general, but simply such as restrain and monopolize trade. And, therefore, before the Government could possibly establish its case, it would have to show that the association in question did actually restrain commerce or tend to monopolize interstate trade. This vital fact, according to Judge Riner, was wanting in the proof and its absence could not but have given the case to the railroads. If a clear instance of restraint or monopoly of trade shall ever present itself, we apprehend the question of jurisdiction of the Circuit Court under the Act will be squarely presented, and on this point the decision of Judge Riner, while not, perhaps, authoritative, will no doubt be very persuasive. The broad question of the right of one railroad to agree with another not to enter into ruinous competition probably did not receive anything like exhaustive discussion in this decision. It is imaginable that such an agreement might tend to produce an injurious monopoly, but as the conditions are such that practically this result is never reached, we may well wait until the Anti-Trust law gets hold of some actually harmful trust before invoking its aid in the regulation of railroads.

The Logic of Economy in Railroad Expenditures.

The paper on "Lubrication" read by Mr. J. N. Barr at the November meeting of the Western Railway Club, which is published on another page, is of importance not only on account of its being an excellent illustration of the saving which can be effected in the one item of freight car lubrication by systematic investigation and carefully kept records, but also on account of the lesson which it teaches in regard to the wisdom of following up railroad expenditures by similar attention to details. Mr. Barr thinks that too much attention has been given in many cases to the details of the design of railroad machinery and equipment, and following up these designs in practice to thoroughly determine their value has been consequently neglected, and that the same is frequently true in regard to the purchase of supplies and their consumption. He shows that in the one item of car lubrication, without changing the character of the lubricant used or making any change in the proportion of the brasses or journals, it was possible to effect a very important saving.

It cannot be questioned that good results would follow a much more careful chasing up of expenditures, small as well as large, than is ordinarily to be found on many railroads. We do not mean the spasms of economy into which some managements are thrown, or throw themselves, periodically, but a systematic and thorough hunt for leaks in all departments, including detailed reports from those immediately in charge of the use of the various supplies, these reports to be summed up by divisions from month to month and year to year in such condensed shape that they can be reasonably sure of receiving the attention of the highest authority. It may be said that this is just what is now being done on any well organized road; and so it is, after a fashion. But as a matter of fact it is very apt to be done in a perfunctory way which in the end amounts to nothing. It is of very little, if any, use for example to have an elaborate system of fuel records when it is well known that an increase of 10 or 20 per cent. will never be inquired into sufficiently to locate the cause or the individuals who are directly responsible. We have in mind one large road on which it is the common report among the engineers that the man who uses an extra pint of oil will get rapped over the knuckles, but he may use three or four extra tons of coal in the same time and never hear from it.

It may be said that such a condition of affairs is the fault of the motive power department, and so it is to some extent. But it is a physical and mental impossibility for any one man to supervise the design, purchase and maintenance of the equipment of a large system, deal with employees, and attend to the multitude of routine executive matters which is referred to him and still have the time or capacity to give to reports of expenditures the attention which is necessary to get good results. The work must therefore be almost wholly done by others. These would naturally be

subordinates in the department in question, but we believe that better results can be secured by employing a technically educated and trained man in some such nominal capacity as assistant to the General Manager or some higher official, whose sole business should be searching for leaks and stopping them. We know of one road at least where this plan has been adopted with gratifying results. The services of such men cannot, of course, be secured for a small salary, but this is not the kind of work on which cheap labor pays.

We are aware that the method of reducing expenses by increasing the salary list several thousand dollars is not one which appeals directly to the non-technical railroad officer or to the stockholder, but as far as we know wherever this system has been applied with discretion in iron and steel works and other large industries it has been found to pay, unquestionably; and similar results have often been reached in railroad work. We would suggest to railroad managers who are not absolutely sure that theirs is the most economically managed road in the country that they secure the services of experts in the use of fuel or oil or any other line which suggests itself as being a possibly promising field for examination, and give the new appointee freedom to go ahead and make his record. It may not be possible to secure convincing results in a year's time but enough progress would be made in that time by the combination of a trained mind, careful attention to the one detail, and the knowledge on the part of the men who use the material and who must therefore ultimately make the saving that a careful record is being kept of their daily work, to produce surprisingly satisfactory results.

Car Lighting in Chicago and New York.

It is evident from the stir being made in car lighting matters in the vicinity of Chicago that there will be changes on most roads before the World's Fair opens next year. At present some of the suburban coaches are so miserably lighted that it is impossible to discern the name on a finely printed ticket. The Illinois Central has probably the worst lighted suburban cars of any road running into Chicago. The lamps are not well cleaned and are of a very old pattern, and to keep them from smoking they are turned down so low that it is impossible to read a daily paper in any part of the car. One Chicago road is to make an extended trial of the storage battery system, with the hope of getting a good and practical electric light. The St. Paul road still continues the use of electric light in a few of its trains. The Chicago & Northwestern has already been benefited by the adoption of the Pintsch gas, and some other roads are following the Northwestern in this respect. The Pennsylvania will take up the Frost carburetor for all equipment. Other roads not using any of these new lights are putting in the best grade of Adams & Westlake kerosene lamps. So far as observation goes, the illumination when well attended to is about equal, whether of kerosene, Pintsch gas, Frost, or electric light, but the electric light has the advantage of being better distributed through the car. It will not reflect credit on the lighting of American railroad cars if the principal line for passenger traffic to the World's Fair grounds next year continues to use the very poor system of illumination which is now in vogue, particularly if the lamps receive no more attention than they do now.

The roads running into New York are much better off as regards lighting than those running into Chicago. Nearly all of the important lines now use Pintsch gas for suburban service at least, and some of them for all through trains, and most of them are increasing their Pintsch equipment rapidly. The Delaware, Lackawanna & Western, which does an immense suburban business on its Morris & Essex Division, has long had the worst lighted trains in that region; but even on that road Pintsch gas is now being introduced. The suburban trains of the Erie, which was a pioneer in the use of the Pintsch gas, are now as a rule admirably lighted, and one can read with comfort in almost any seat. When this is not the case it is due to the carelessness of the trainmen. The Pennsylvania is one important exception to the general use of the Pintsch gas, as it uses and will continue to use as standard the dry carburetor system, and, whatever may be said for or against this system, as a light it is very satisfactory.

The one New York road, however, that is inexcusably backward in improving its car lighting is the Manhattan Elevated system, which sticks to kerosene lamps and uses lamps of insufficient power and in insufficient number. When the immense passenger business of this road is considered, it is probably safe to say that the poor lighting of its cars causes more inconvenience than the same quality of lighting would cause on all the railroads entering the city put together; and while we seldom find fault with the management of this system, we hold that a radical improvement in this particular is due to the great public which uses its cars. Probably the management could do no one thing that would have a better effect on public opinion than to put in a first-class modern system of lighting.

Annual Reports.

New York, Lake Erie & Western.—This report is for the year ending Sept. 30, 1892. The general results of operation are:

Gross earnings, entire system.....	\$31,281,754
Due leased lines worked on percentage.....	2,022,944
Accruing to the Erie company.....	\$28,633,740
Operating expenses.....	21,466,783
Net from traffic.....	\$7,166,957
Income from other sources.....	1,025,844
Interest, rentals, etc.....	\$8,202,801
Surplus.....	\$733,260

A comparison of these figures for five years is made in the table below in which the quantities are expressed in millions and decimals of a million.

	1892.	1891.	1890.	1889.	1888.
Gross earnings.....	\$31.3	\$30.1	\$29.1	\$27.0	\$27.2
Proportion due leased lines.....	2.6	2.6	2.6	2.4	2.4
Working expenses.....	21.5	20.2	19.5	17.9	18.0
Percentage, expenses to earnings.....	68.7	67.1	70.1	66.4	66.2
Net earnings.....	7.2	7.3	6.9	6.7	6.8
Other income.....	1.0	1.0	1.1	1.1	0.9
Interest, rentals, etc.....	7.5	7.3	7.2	7.0	7.0
Surplus.....	0.73	1.01	0.86	0.77	0.74

On the face of the report several reasons appear for the falling off in the net earnings this year as compared with last. Taking the Erie proper, that is including all lines except the N. Y., P. & O., the gross earnings increased 4.5 per cent., the working expenses 4.6, net earnings from operation 4.2, and net earnings after deducting the proportion due leased lines, worked on a percentage, 4.3 per cent. Excluding the N. Y., P. & O., therefore it appears that there was a proportionate falling off in the net earnings, although they increased absolutely. The fact is, that while the freight earnings increased 7.3 per cent., and the ton miles 15.29 per cent., the rate per ton per mile for general freight fell from .733 cents to .682 cent. There was a gain, however, both in tonnage and in rate on the coal freight. The ton miles of coal increased 3.32 per cent., and the rate increased from .540 to .554. The passenger mileage increased slightly, but the earnings per passenger mile fell from 1.545 cents to 1.490 cents. The switchmen's strike at Buffalo, Black Rock and Suspension Bridge had much to do with the diminished net earnings, occurring as it did at a time when the business at those points is heaviest. During its continuance, practically no business was done at or through those points. There have been heavy charges for improvements carried to the operating expense account also. Among these are 15,488 tons of 80-lb. rail laid during the year, and other permanent improvements including the extension of the block system. Over \$350,000 has been expended on repairs, renewals and reconstruction of bridges on the Erie Division. We are not told whether or not this was charged to operating account, but probably it was.

But a serious inroad in the net earnings is made by the deficit in operating the New York, Pennsylvania & Ohio. While the percentage of gross earnings to working expenses on the Erie proper increased from 66.6 per cent. to 68.7 per cent., on the N. Y., P. & O., this percentage increased from 68.3 to 75.1. On this road the ton miles increased 6.37 per cent., and the rate fell from .504 to .580 cents. The ton miles of coal increased 17.7 per cent., and the rate fell from .5 to .474 cent. The passenger mileage fell 5.60, and the rate per mile fell from 1.845 cents to 1.812 cents. Meantime there has been a material expenditure for betterments on the line of the N. Y., P. & O. Forty-nine miles of track have been laid with 80-lb. steel and charged to operating expenses. About \$56,000 has been expended for renewals of bridges, leaving but four wooden bridges on the road, two of which will be renewed during the coming year. The report adds, that the increased tonnage and decreased rate on the N. Y., P. & O. demonstrates very forcibly the burdensome character of the lease, and the company again urges that these conditions could be relieved and the property enhanced in value and made more profitable by the adoption of a proper financial scheme, whereby funds might be obtained upon a security of the property without very largely increasing its annual burdens. It is believed that the trustees of this property fully comprehend the gravity of the situation and the necessity of improving its physical character.

The work of extending block signaling has been carried on and at the close of the year the block system was in use from Jersey City to Salamanca, 413 miles, and the work of blocking the Buffalo and Niagara Falls Division was practically completed. With this in use the main line east of Salamanca and Suspension Bridge with most of its important branches will be protected by block signals. The use of interlocking has also been extended. On the N. Y., P. & O. the block system has been extended, and it is now in operation from Salamanca to Marion Junction, that is it is in complete operation from Jersey City to Marion Junction, a distance of 719 miles. Arrangements are nearly completed for blocking the line from Marion to Hammond Junction, and this will be completed before the opening of the World's Fair.

The physical improvement of the Chicago & Erie has been carried on, over 7,000 tons of 80-lb. rails having been laid, and the substructure of five iron bridges has been renewed and 70 wooden trestles have been replaced by masonry and iron bridges. Fifty-

eight openings of old wooden trestles have been replaced by pipe and filling. The greater portion of all this expense has been charged to operating account. On this part of the system seven interlocking machines were erected during the year at grade crossings. It is said that it will take considerable expenditure for another year at least, to bring the Chicago & Erie up to the standard of the other lines of the Erie system.

The Board had seriously considered the declaration of a dividend on the preferred stock, but owing to the Buffalo strike and other considerations it was thought prudent not to declare such a dividend this year. The President's report concludes with a hint that measures will be taken to raise additional money to be expended in the improvement of the property.

One gratifying feature of the report of the Erie proper is a slight decrease in cost of motive power and a large decrease in general expenses, while operating expenses increased as a whole 4.64 per cent. The haul of freight increased on the Erie proper from 151 to 165 miles, the train load from 244 to 253 tons and the earnings per freight train-mile from \$1.58 to \$1.50. On the N. Y., P. & O. the cost of motive power increased 9.1 per cent., and the total working expenses 10.4 per cent. Here the train load fell from 192 tons to 185, the haul from 127 miles to 128, and the earnings per freight train-mile from \$1.10 to \$1.03.

Baltimore & Ohio.—The fiscal year has been changed to end June 30, but tables of results of operations are given for the 12 months to Sept. 30 for comparison with 1891.

The general results follow:

	1892.	1891.	Inc. or dec. per cent.
Earnings:			
Freight.....	\$17,422,583	\$16,813,020	I. 3.63
Passenger.....	6,812,435	5,974,542	I. 13.68
Mail, express, etc.....	1,939,149	1,742,834	I. 10.68
	26,034,168	24,530,395	I. 6.13
Expenses:			
General.....	1,730,469	1,608,884	I. 7.52
Conducting transportation.....	10,104,018	9,177,901	I. 10.08
Maintenance of equipment.....	3,559,999	3,329,438	I. 6.91
Ways.....	3,201,415	2,882,910	I. 11.06
	18,595,901	17,078,232	I. 8.89
Net from operations.....	7,438,267	7,452,162	D. 0.19
Other income.....	1,866,060	1,359,877	I. 37.31
	9,304,327	8,812,039	I. 5.58
Less Washington branch.....	2,542	190,767	I. 97.68
Available.....	9,098,941	8,621,272	I. 5.47
Interest, rental, etc.....	6,639,722	6,429,098	I. 3.27
Balance.....	2,459,219	2,092,175	I. 17.50
Dividends.....	612,429	300,000	I. 104.00
Other payment.....	674,057	471,558	I. 42.53
Surplus.....	1,173,233	1,320,617	I. 12.35

The net earnings are somewhat less than they were in 1890 also, but much greater than in any other year since 1884. It will be observed that the operating expenses have increased in a greater ratio than the gross earnings, and also that the passenger earnings have increased very much more rapidly than the earnings from freight. The President attributes the relative falling off in net earnings to the low freight rates prevailing during the last half of the fiscal year "notwithstanding the fact that the Trunk lines were at the time overburdened with traffic," and he also says that the revenues of certain divisions were injuriously affected by the Homestead strike. Therefore while the total tons carried increased from about 11,900,000 to 15,700,000 in the 12 months, the net result from freight was not so good as the last year. The ton-miles, including coal and coke, for the nine months were 1,800 millions in 1891 and 2,040 millions in 1892. This is exclusive of coal and coke for the company's use. Operating expenses have probably continued to be augmented by charging to that account further heavy payments for improvements.

In the General Manager's report we find a continued movement towards economy in the increase of train load. For the nine months of 1892 the freight train miles increased 7.18 per cent., but the freight car movement increased 11.25 per cent.

On the lines east of the Ohio River 221 miles of road were rebalanced, and important repairs were made to bridges and culverts; 37 miles of side track was also built. Nearly 11,000 tons of 85-lb. rail was laid, most of it on the Philadelphia division. The block system has been largely extended during the year. It has been entirely completed on the Philadelphia division, and from Washington Junction to Cumberland also the line has been completely equipped. On the lines west of the Ohio River over 4,300 tons of 67-lb. rail has been laid, and considerable other work in improvement of track and structures has been done. The common stock was increased during the year from \$15,000,000 to \$25,000,000. Of this \$5,000,000 was sold to a syndicate and the remainder was absorbed in a 20 per cent. stock dividend and for the purchase of the stock of the Pittsburgh & Western.

On another page we publish some results of tests of Parson's steam condensing turbines by Professor Ewing, of the University of Cambridge. These turbines are being put in the central electric lighting station at Cambridge, England. In view of the fact that former tests of steam turbines have shown them to be very extravagant in the use of steam, the results of these later tests are particularly important. It is shown that by the combination of a compound steam turbine and a dynamo directly coupled to it an electrical horse power at the terminals

of the dynamo can be developed on about 21 lbs. of feed water supplied to the boiler. When the simplicity and compactness of the arrangement is considered it is difficult to overestimate the importance of these figures. The factor which remains to be determined is the endurance of the various parts of the steam turbine, but Professor Ewing's remarks would indicate that there will probably be but little difficulty on this account. Taking the efficiency of the dynamo as given in this case at 97½ per cent, and allowing five per cent. for engine friction gives the equivalent of 21 lbs. of feed water per electrical horse power as 19.4 lbs. per indicated horse power. The turbine combination has the further advantage that it is exceptionally light and compact, of small first cost, requires but light foundations, is free from vibration, governs well and may be expected to show small cost of maintenance. The principal facts which have stood in the way of its introduction in various classes of work have been the large steam consumption and the high rotative speed. As shown in this case there is no difficulty on the latter score in driving dynamos, and these tests certainly contradict previous tests on the question of economy. Former tests of other steam turbines have shown nothing better than 45 lbs. of steam per effective horse power and an early form of the Parsons turbine gave 52 lbs. per electrical horse power.

The collision at West Manayunk, Pa., on Oct. 24 is furnishing no end of news for the Philadelphia papers, the death of one of the victims in another county having necessitated a second inquest, which has resulted in a verdict quite different from that found in Montgomery County and heretofore reported in the *Railroad Gazette*. The last verdict holds the conductor and engineer of the freight responsible because they left Pencoyd, after they had been flagged to stop there, without obtaining a clearance. The principal new evidence brought out is, that these two men had been on duty, without sleep, for 36 hours, which, in addition to the fact that they were practically unacquainted with the road, goes to show that they were decidedly unfit for their places, whatever their precise neglect may have been. This jury definitely decided that Yardmaster Rupp was not responsible, but it is by no means clear that the decision holding the conductor and engineer guilty is based on good grounds. The operator at Pencoyd now says that he saw the assistant (to whom the station agent gave the order) go out and wave the red flag as the freight approached; but the conductor, who was on the locomotive, and the engineman, both deny seeing the flag. It does not appear that the order to hold the freight at Pencoyd was shown to either the conductor or engineer. Under these circumstances it is easy to construct a theory which explains the apparent discrepancy. The flag was waved and the man holding it saw that the freight train stopped, but the engineer and conductor, knowing that they had to stop there to take on cars, made the stop without noticing the flag. Rupp, in his testimony, placed great emphasis on the fact that he had told the freight conductor that his train was to meet the passenger train at Pencoyd, also that he told him the southbound track was blocked. This, of course, was unofficial information, so far as a meeting point was concerned, and the conductor's denial that he was thus told, was one of the inexplicable things about the first examination; but if he was very tired or sleepy it will not be hard to account for it. The inadequacy of the regulations of the company appears in even stronger light than before. The circumstances connected with the display of the flag forcibly show the need of a fixed signal, to remain displayed; and the excessive working hours will constitute, in the eyes of many persons, the worst feature of all.

The New York & New England, not dismayed by the failure of the Oyster Bay Line, is to put on another through night train between New York and Boston, this time over the New York & Northern. The trains are to start from each end at 10:30 p. m., and run through in 8½ hours. As the New York terminus is at 155th street, six or eight miles from the centre of the city, this will mean to the passenger, practically, nine hours or more, but as it is a night run its length only means going to bed and getting up at comfortable hours. Passengers from New York who have baggage will, we suppose, have to deliver it at the Fifty-third street station of the Sixth avenue line of the Manhattan elevated, from which point baggage cars are now run to connect with certain trains of the New York & Northern. The distance through by this line is 244 miles; or, counting from the hotel centre of New York, 250 miles in round numbers. The making of a line like this was one of the objects in view when the New York & Northern was built, but it is now a dozen years since the road was completed. This long delay in the consummation of the plan is, as every one knows, on account of the length of the line and the unfavorable location of the New York terminus. Whether the fare is to be less than by the old and direct lines, has not been announced. If the through rate is not less than \$5 it is not likely that the locomotives will be worked very hard. The trains begin running next week.

The New York *Herald*, which tried to convince itself and its readers that the Trunk lines had formed a pool has got hold of the official report of the proceedings, and

this week comes out with another scare head, asking "If Not a Pool, What Is It?" The fact that the first report was erroneous and misleading seems to have partially filtered into the reporter's brain. But his whole air castle is based on the claim that the resolution empowering the commissioners to judge what share a certain competitor ought to have and to try to enable him to secure that share at a future time is the same as an agreement binding a railroad company actually to hand over freight or money to a competitor to make up for a deficient share in the past. The details printed by the *Herald* add little not given out last week. The commissioners will endeavor to fix the rates about the 20th of each month, which seems to mean that inequalities in December shall be corrected by a change in the rates in February. The commissioners have been empowered to abrogate time contracts on all the roads where it is legally possible to do so. Mr. Walker's title is to be Chairman of the Joint Committee. The *Herald* prints the following as the percentage carried by each trunk line during the period from Jan. 1 last to Nov. 19: New York Central, 23.7 per cent.; Erie, 16.4; Pennsylvania, 22.4; Baltimore & Ohio, 7.3; West Shore, 8.3; Lackawanna, 10.4; Lehigh Valley, 9.1; Ontario & Western, 2.4. This probably means westbound freight to and beyond Buffalo, Pittsburgh, etc.

The only uncertainty about the success of the World's Fair is the constant menace of cholera. People do not talk about it much, but those who read and reflect know very well that the danger is not past. The consensus of opinion among scientists and those qualified to judge makes it apparent that we may expect a visitation of cholera with the advent of warm weather. Cholera experts believe that many germs of the disease are now dormant in the country only awaiting the necessary conditions of warmth, moisture and filth to develop into virulent foci of contagion and death. The continuance of immigration and the importation of rags furnish additional means for the germs to come here, notwithstanding the twenty days quarantine. Our only safety, so far as new centres for disseminating contagion is concerned, is placing an absolute embargo on each of these. Much can be done to nullify the danger of an epidemic lighting up in the early summer by cleaning up the cities, towns and great arteries of trade, the railroads. Woe to the city that neglects this precaution. The transfer of business to other cities, which have heeded the warning, injury to the transportation lines which enter its limits, emigration of its people; all these, and more, will result. But after the National Government and the municipalities there are no bodies or organizations that have so much power to arrest an epidemic of cholera at the ports as the railroads themselves have.

The compound locomotive still continues at the head of the list for high speeds on short runs. One of the first very high speed records was made by the Wordsell compound on the Northeastern of England, an account of which was given in the *Railroad Gazette* of March 28, 1890. Last week we gave an account of a mile made in 37 seconds by the Baldwin compound No. 385 on the Central of New Jersey between Philadelphia and Jersey City. The compound engine was at first criticised for its apparent lack of power at high speeds, but it cannot now be said that the compound is a slow engine, and those who do not favor compounding will have to look about to find a substitute for this objection, which is now shown to be without good foundation. The Pennsylvania road has now four types of compound engines, and recent tests for speed indicated that the standard simple engine of that road is faster than any of the compounds, but this test is not to be taken as conclusive, as the engines are not comparable, in several respects, and it may be that future and more complete tests will show that one or two of the compounds are as fast, if not faster, than the standard simple engines. There is much general interest among railroad men in the new compound built by the Pennsylvania road at Altoona, as it has several important improvements that are conducive to high speed.

TRADE CATALOGUES.

Pneumatic Machinery and Heating and Ventilating Apparatus.—The Huyett & Smith Manufacturing Co., Detroit, Mich., issues an illustrated catalogue of 102 pages, with an index, showing the machinery manufactured by that Company. This includes dry kilns, hot-blast apparatus, ventilating fans, water tube boilers, exhaust fans, and in fact a great variety of machinery for kindred purposes. One very neat device is a ventilating fan with direct attached electric motor. The Smith pressure blowers with double discharge are shown, and the theory of their action is well explained. The application of the hot blast apparatus to lumber drying kilns is also described at considerable length.

Electric Railroad Machinery.—The Westinghouse Electric & Manufacturing Co. of Pittsburgh, Pa., has issued, under the title "Testimonials Regarding Railway Apparatus," a very handsome little book of 84 pages, made up almost entirely of letters from companies using its machinery on electric railroads. The testimonials are with regard to the performance of single reduction motors and multipolar generators. The small expense of

repair is a point very generally mentioned. On one road the total electrical repairs on 13 cars equipped with two 20-horse power motors each, where the conditions are more than usually severe, was less than .0029 cents per car mile. This was the average from 15 months' service. The good results got with direct connected generators are also especially mentioned, and the Company predicts that during the next 12 months these machines will be generally recognized as the most desirable. No mention is made of double reduction motors except a statement that the Company long since ceased to make them. A list of 11 railroads is given as being "among the large roads" which the Company is now under contract to equip.

Discipline on the Chicago Elevated.

(Continued from page 901.)

After a suitable preamble the order is divided into nine heads as follows:

I. Rules and Regulations.—With sundry modifications the Rules of the Rapid Transit and Bridge Construction Company will be adopted by this company. Particular attention is called to the following extracts from those rules and regulations:

"1. Acceptance of service with the company will be understood as an acquiescence in its policy, rules and regulations, which will be rigidly enforced. Therefore any employee who is not prepared to obey them with cheerfulness and alacrity is expected to resign to escape being discharged. It will be the policy of the company to identify the interests of its employees with its own, and to that end every employee is entitled to and will receive a patient and kindly hearing from the officers of company whenever they are consulted. Employees are also free, at all times, to lay any grievances they may have before the General Manager, personally. But while faithful service and zeal for the company's welfare will be estimated at its full value and suitably rewarded, every employee detected in attempts to create disturbances or dissatisfaction in the service, or in any other manner interfering with the company's policy, or prejudicing its interests, will be summarily dismissed.

"2. Disobedience of orders, violation of rules, or other neglect of duty, will be considered sufficient cause for dismissal; though for minor or first offenses suspension from duty and pay may, in the discretion of heads of departments, be substituted for dismissal. * * *

"3. No employee will be promoted or transferred except upon the nomination of the head of his department and the approval of the General Manager.

"4. While the company reserves the right to select experienced men from every source at its command for positions of responsibility and trust, it will, as far as possible, fill vacancies from within the service, upon combined merit and capacity for increased responsibility. Therefore, the advancement of employees of every grade will depend upon faithful discharge of duty, their devotion to the interests of the company, and their qualifications.

"5. Examining Boards will, from time to time, be convened by the General Manager to ascertain the qualifications of persons nominated by heads of departments for appointment or promotion. The results of such examination will largely determine the General Manager's final action upon nominations. Applicants for admission to, or promotion in, the Operating and Traffic Departments, will be additionally examined by the Medical Director of the company to determine their physical fitness.

"6. Employees resigning from one department will not be employed in any other department without the approval of the General Manager. * * *

II. Appointments.—Recognizing that for the efficient and safe administration of an elevated railroad the highest type of skilled labor is required in its several branches, the Chicago & South Side Rapid Transit Railroad Co. has fixed a high standard of qualifications for the personnel of its service, and will appoint to permanent positions only those who, upon examination, prove their capacity to be up to that standard. In addition to the required technical skill and experience, all applicants must demonstrate that they are active, able-bodied men, of good morals, temperate habits, and possess sufficient general intelligence to warrant the belief that, within a reasonable time, they can qualify for promotion in their respective branches of the service. All new appointees must immediately familiarize themselves with the book of Rules and Regulations, and General Orders of the Company, and with the peculiarities of elevated service, and will not be promoted or have their pay advanced until they have passed a satisfactory examination upon those points. This requirement does not apply to employees of the Rapid Transit & Bridge Construction Co., who, having previously passed the required examination, may be certified to this company as possessing the necessary skill, experience and knowledge for its service.

III. Promotions.—All employees will be regarded as in the line of promotion within their respective departments, dependent upon the faithful discharge of their duties and capability for increased responsibilities. Cheerful obedience and thorough observance of regulations and orders, correct deportment, zeal in the performance of duty, and care and economy in the use and expenditure of the company's property, will be required of every employee. An accurate and complete record of the service of employees will be kept by each head of department, and will form the basis for determining the merits of applicants for promotion. Qualifications and general fitness for any vacant position being equal, employees having the best service records will be given preference in making promotions, but this is not to be understood as binding the company to fill any given position by promotion, when its interests will be better served by selecting an appointee from another branch of the service or from the public at large. Length of service being rewarded by increased pay, seniority will govern promotions only when two or more applicants are found to be equal in all other respects. The question of seniority will be understood as applying only to employees working in the same department and in the same branch of the service.

IV. Resignations.—Any employee who has served the company for not less than one year will, upon application to the head of the department in which he served, be entitled to an official statement of his service, as shown by the record, and of the cause of his leaving the company's employment. Letters of recommendation filed with the applications of employees will be returned, if called for, when they leave the company's service. Employees who voluntarily leave the service to engage in other pursuits, or to work on other roads, and subse-

RAILROAD MILEAGE OF THE WORLD IN 1890.

Prepared for the Eleventh Census by Henry C. Adams.

COUNTRIES.	Length of line, (Miles.)	Square miles of territory.	Length of line per 100 square miles of territory.	Number of inhabitants.	Length of line per 10,000 inhabitants.
Europe.....	136,865	3,777,938	3.62	356,826,000	3.81
Germany.....	25,960	208,672	12.44	48,572,000	5.35
Austria and Hungary, including Bosnia.....	16,467	261,201	6.30	42,087,000	3.91
Great Britain and Ireland.....	19,939	121,436	16.42	38,584,000	5.17
France.....	22,586	204,155	11.06	38,219,000	5.91
Russia, including Finland.....	18,728	2,080,510	0.90	96,000,000	1.95
Italy.....	8,117	114,372	7.10	30,917,000	2.62
Belgium.....	3,215	11,387	28.22	6,191,000	5.28
Netherlands.....	1,887	13,712	13.73	4,762,000	3.85
Switzerland.....	1,929	15,942	12.10	2,931,000	6.57
Spain.....	6,127	198,401	3.09	17,545,000	3.49
Portugal.....	1,280	31,315	3.73	4,307,000	2.97
Denmark.....	1,223	14,784	8.27	2,172,000	5.63
Norway.....	971	125,044	0.77	1,978,000	4.91
Sweden.....	4,915	173,932	2.83	4,774,000	10.30
Servia.....	327	18,780	1.74	2,096,000	1.56
Roumania.....	1,580	49,954	3.21	5,376,000	2.94
Greece.....	440	24,974	1.76	2,187,000	2.61
Turkey in Europe, Bulgaria, and Roumelia.....	1,057	106,034	1.03	7,641,000	1.44
Malta, Jersey, and Man.....	68	425	16.00	311,000	2.19
North America.....	182,937	7,020,606	2.61	82,036,714	22.30
United States.....	163,597	2,970,000	5.51	62,917,714	25.90
British America (Canada).....	13,322	3,084,410	0.43	4,399,000	30.35
Newfoundland.....	115	42,780	0.27	198,000	5.81
Central America (Guatemala, Salvador, Costa Rica, Nicaragua, and Honduras).....	559	172,117	0.32	2,901,000	1.93
Mexico.....	5,314	751,319	0.71	11,601,000	4.61
South America.....	16,552	7,010,918	0.24	36,401,000	4.55
United States of Colombia.....	231	461,397	0.05	4,000,000	0.58
Cuba.....	1,054	42,837	2.30	1,521,000	6.91
Venezuela.....	441	914,306	0.47	2,238,000	1.97
Republic of Santo Domingo (eastern part of the island of Haiti).....	71	17,447	0.41	610,000	1.16
Porto Rico.....	11	3,706	0.30	785,000	0.14
Brazil.....	5,779	3,218,159	0.18	14,602,000	3.96
Argentine Republic.....	5,129	1,076,708	0.48	3,818,000	13.47
Paraguay.....	149	97,697	0.15	330,000	4.52
Uruguay.....	470	72,143	0.65	687,000	6.84
Chili.....	1,926	296,576	0.64	2,715,000	7.09
Peru.....	991	401,030	0.25	2,630,000	3.78
Bolivia.....	106	515,001	0.12	1,190,000	0.89
Ecuador.....	167	115,616	0.14	1,005,000	1.66
British Guiana.....	22	83,383	0.03	278,000	0.79
Asia.....	18,798	4,105,380	0.46	712,118,000	0.26
British India.....	15,837	1,455,063	1.19	255,618,000	0.62
Ceylon.....	180	21,713	0.73	2,853,000	0.63
Russia (Transcasian district).....	890	214,191	0.42	430,000	20.70
Persia.....	11	636,205	0.00	8,000,000	0.01
Dutch (East India).....	797	50,836	1.57	21,998,000	0.36
Japan.....	297	147,606	0.61	39,607,000	0.23
China (proper).....	124	1,555,534	0.01	381,555,000	0.00
Cochin China and Pondichery.....	32	29,199	0.22	2,017,000	0.26
Africa.....	3,992	587,184	0.63	7,785,000	5.13
Algeria and Tunis.....	1,923	229,245	0.84	5,317,000	3.62
Cape Colony.....	1,785	217,357	0.82	1,377,000	12.96
Natal.....	234	18,760	1.25	481,000	4.86
South African Republic.....	50	121,822	0.04	610,000	0.82
Australia.....	11,137	3,074,336	0.36	3,828,000	29.09
New Zealand.....	1,305	104,220	1.83	662,000	28.78
Victoria.....	2,288	87,851	2.60	1,118,000	20.47
New South Wales.....	2,252	306,070	0.73	1,122,000	20.07
South Australia.....	1,757	908,163	0.19	324,000	54.23
Queensland.....	2,053	668,050	0.31	407,000	50.69
Tasmania.....	375	26,324	1.42	151,000	24.83
Western Australia.....	497	975,615	0.05	44,000	112.95
RECAPITULATION.					
Total.....	370,281	25,376,762	1.45	1,198,694,714	3.09
Europe.....	136,865	3,777,938	3.62	356,826,000	3.84
North America.....	182,937	7,020,606	2.61	82,036,714	22.30
South America.....	16,552	7,010,918	0.24	36,401,000	4.55
Asia.....	18,798	4,105,380	0.46	712,118,000	0.26
Africa.....	3,992	587,184	0.63	7,785,000	5.13
Australia.....	11,137	3,074,336	0.36	3,828,000	29.09

quently re-enter the service of this company will rank as new men.

[NOTE.—The term "suspension" will be applied to those relieved from duty for a definite time and for cause; the term "discharge" to those who leave the company's service by reason of reduction of force or for other cause for which they are not to blame; the term "dismissal" only to those dropped from the service because of violations of rules or misdemeanors. The power of suspension is confined only to heads of departments and to chiefs of divisions and will be exercised by them with moderation and discretion. Severe punishment will not be inflicted for trivial offenses, except where they are wilfully or persistently repeated.]

V. Discharges.—Should it at any time become necessary to reduce the number of employes in service, preference in continued employment will be given: 1. To those who have the best examination and service records, combined. 2. To those who are married, or, not married, having family responsibilities.

VI. Suspensions.—Employes will be liable to suspension from duty: 1. While awaiting investigation of charges made by responsible persons. 2. In the discretion and upon the responsibility of their superior officers, for intemperance, drinking on duty, or appearing upon the company's property under the influence of liquor; dishonesty; incompetency; gross carelessness or habitual neglect of duty; repeated violations of rules and orders; insubordination, or other good and sufficient causes. When such suspension is for more than five days it must be sanctioned in writing by the head of the employe's department.

Employes charged with offenses involving suspension or dismissal, will be entitled, upon appeal, to a thorough and fair investigation of such charges as soon as possible after the facts shall have been ascertained, and, except where greater delay is unavoidable, within seven days from the date of appeal. Such investigations will be conducted by a board of disinterested officers of the company, and an accused employe will have the right to be represented before the board by any co-em-

ploye of his grade whom he may select to conduct his defense. While thus engaged, such co-employe will be considered on duty, and will be entitled to his usual pay. In case the charges are not proved, the suspended employe will be reinstated to duty without loss of pay.

VI. Dismissals.—Employes will be dismissed only when the gravity of their offenses is greater than can be adequately punished by suspension. While, as aforesaid, employes may be suspended, with loss of pay, by their immediate superior officers, no one will be actually dismissed from the service without the approval of the President or General Manager of the company.

VII. Fines.—It will not be the policy of this company to impose fines upon its employes for any cause whatever.

The most conspicuous merit of this document is its putting in words a number of things which managers generally relegate to the "unwritten law." Dr. Barnard not only frankly avows his position on all essential points, but does it at the outset, of his own motion, not waiting to do it ungraciously after being intimidated by a "committee" of unreasonable agitators, whose power threatens to impair the road's earnings for a few days. Ultra-conservative managers will say that he grants too much; that he will not be able to do for his men all the pleasant things mentioned, and that some of the concessions will encourage unscrupulous employes to be more overbearing than they otherwise would be. But it will be time enough to offer that criticism when the predicted difficulties appear. Gentleness in business affairs always implies sufficient firmness to act as a regulator, and there is no evidence that the firmness is lacking here.

The pay of trainmen and stationmen is considerably higher than on the Manhattan. The engineers, who get \$3.50 a day for the first half year, do not get their highest rate (\$4.50) until the fourth year. On the Manhattan \$3.50 is the highest rate. Conductors and switchmen also wait three years for their maximum, \$3. This is 70 cents higher than conductors get in New York.

The hours are substantially the same as on the Manhattan, except for ticket sellers, who in New York work 12 hours in all cases. The seven-hour trick in Chicago seems to be established to conceal a 14-hour day, as the rate, \$1.25 a day, is not more than half what a ticket seller ought to receive. Although the Manhattan works its enginemen and firemen 8½ hours it pays them for nine hours. To avoid friction the Chicago road will probably have to make its actual schedules considerably less than 8½ hours, though the uniformity of the runs on a single line like the South Side will make regularity easier to maintain than on such a system as that in New York.

Railroad Mileage of the World.

The Census office has issued an extra bulletin (No. 24) giving the number of miles of railroad in the world in 1890. The precise date is not given and there is nothing said about the sources from which the foreign statistics were procured. A main feature of the bulletin is a series of diagrams showing the statistics in graphic form. We print the principal table herewith.

TECHNICAL.

Manufacturing and Business.

Carroll Brothers, of Buffalo, N. Y., want to purchase 150 tons of second hand 40-lb. rails for relaying purposes.

The Westinghouse Electric Co. has now 2,000 men on its pay roll at the Pittsburgh factory, and is just starting up work in the old air brake works in Allegheny.

The Russell Wheel & Foundry Co., of Detroit, is very busy in its new shops, where the facilities are such that there is no trouble in attending to all orders. About 125 to 150 cars are turned out every month.

The E. P. Allis Co., of Milwaukee, will give special attention to electrical machinery when the new addition is completed. A 50-ton and a 20-ton electric traveling crane will constitute a part of the equipment of the new machine shop. The outlay will be nearly \$250,000.

The Diamond State Car Spring Co., of Wilmington, Del., is building an addition to its foundry.

The Tacony Iron & Metal Co., Tacony, Pa., has placed an order with the Niles Tool Works for a lathe of 48-in. swing and 30 ft. between centres, which is intended for operating the very large castings, such as iron pillars and girders.

Best, Fox & Co., of Pittsburgh, have an order for a set of Gayley's bronze cooling plates, to be furnished to the Pennsylvania Steel Co., at Sparrows' Point, Md.; also one set to be furnished to the Edgar Thomson Steel Works. This firm recently shipped an order of 30,000 lbs. of ingot bronze to the Chicago, Burlington & Quincy.

The foundations for the new Bessemer plant, now under erection by the National Tube Works Co., at McKeesport, Pa., have been completed, and work on the superstructure has been commenced. The Pittsburgh Iron & Steel Engineering Co., of Pittsburgh, is erecting the plant.

The Burrows Car Shade Co., of Portland, Me., has received a contract to furnish 1,000 of its automatic car curtains for the Delaware & Hudson Canal Co.

Iron and Steel.

The Indianapolis Rolling Mills Co., has been incorporated, with a capital stock of \$500,000. This company will at once begin the construction of a rolling mill plant. The following are the incorporators: F. L. Langan, Lima, O.; Henry H. Gregg, Purcellville, Va.; and V. M. Bayless, O. C. Merriman, Thomas Lowry, E. W. Herrick, W. W. Herrick, O. T. Swett, O. C. Merriman, Jr., J. F. Conklin, F. C. Barrows and F. G. James of Indianapolis. The officers of the company are: President, V. W. Bayless; Vice-President, O. C. Merriman; Secretary, F. L. Langan; Treasurer, O. C. Merriman, Jr.

The old mill at the Edgar Thomson Steel Works plant has been started up on light rails, varying in weight from 20 to 45 lbs., and the Carnegie Steel Co., Limited, is now in position to fill orders for the above sized rails. All the short rails of the large pattern are sawed into sections and rolled into the smaller ones.

The Monitor Iron Works started its new works at Newark Nov. 29. The company began in August the erection of its works at Newark, and has put up eight large buildings. The works at Sing Sing will be continued until spring, when additions will be made to the Newark works.

The secretary of the Colorado Coal & Iron Co. announces that the consolidation of the Colorado Coal & Iron Co. with the Colorado Fuel Co. having been perfected by the incorporation of the Colorado Fuel & Iron Co., the stock of the new company will be issued in exchange. The holders of the Colorado Coal & Iron Co. stock will be entitled to four-tenths of one share of common stock of the Colorado Fuel & Iron Co. and six-tenths of one share of the stock of the Colorado Coal & Iron Development Co. for each share of the Colorado Coal & Iron Co.'s stock.

As soon as the Duluth & Iron Range branch to the Cincinnati mine is completed, a hoisting plant will be shipped in. It consists of two engines with 16x24 cylinders and four 4-ft. drums. A Rochester hoist with 5-ft. drum has also been ordered for the Hale mine.

New Stations and Shops.

The car shops of the Lima Locomotive & Machine Co., at Lima, O., which were burned last September, will probably be again in operation by Dec. 15. The greater portion of the plant is now rebuilt, the new wood-working shop being 70x200 ft., blacksmith shop 165x74 ft., and machine shop 134x74 ft.; the buildings are all brick with slate roofs and will be equipped with the latest machinery, a portion of which has already been purchased. This plant formerly belonged to the Lafayette Car Works, but was purchased by the Lima Locomotive & Machine Co. some time ago.

The New York, Ontario & Western has begun the erection of a new passenger station at Middletown, N. Y., to cost about \$50,000. The building, designed by Mr. Bradford L. Gilbert, of New York, contains rooms for the Chief Engineer and his assistants, the Superintendent of Motive Power, Road Master, Train Despatcher and other officers, and a part of it is three stories high. The main building is 35x75 ft. with an extension 30x30 ft. for a kitchen. The largest room in the building is the restaurant, 32x86 ft.

The additions to the shops and freight house of the Chicago, St. Paul, Minneapolis & Omaha, in St. Paul, have been completed. Work on the stations at Hudson, Wis., and Sioux Falls, S. D., is progressing satisfactorily and the structures will be completed in about a fortnight.

The Great Northern has received nine tenders from contractors for building the shop plant at Spokane. The contract will probably be awarded this week.

The Louisville, Evansville & St. Louis will build a new passenger station at East St. Louis, and the plans have been adopted. The new station will be erected on Broadway, near the viaduct. It will be of pressed brick with stone trimmings, two stories in height, and will cost between \$15,000 and \$20,000. In the rear of the passenger depot will be built a freight depot.

The Trinidad Terminal Co. proposes to build a union station at Trinidad, Col. This company includes the Denver & Rio Grande and the Ft. Worth lines of the Union Pacific, and both companies operate a union yard there, paying the operating expenses on a wheelage basis. Efforts are making to interest the Atchison, Topeka & Santa Fe in the union station scheme, but there is little hope of succeeding. Superintendent Burns, of the Denver & Rio Grande, and other officers of that company were at Trinidad last week looking into the matter, but nothing definite has yet been accomplished relative to plans or contracts.

The Harris Car Works, at St. John, N. B., are likely to be transferred to Amherst, N. S. The raising of the \$40,000 stock, in Amherst, is now almost an accomplished fact, only about \$5,000 more being required to bring the amount of stock up to the required figures.

Nickel Steel for Machinery.

Commodore Melville, Chief Engineer of the Navy, has been placed in possession of the results of some very valuable experiments which have been made by the Bethlehem Iron Co., and, as a consequence, has decided to test the value of nickel steel in connection with machinery. To this end, a section of the propeller shafting of the "Brooklyn" and the sea-going battleship "No. 1" will be made of nickel steel, in order to test, on a practical working scale, whether it really has the advantages that it promises. We have already noted some of the remarkable results of tensile tests both in ultimate strength and in elongation, and with this great strength there could be a considerable saving in weight.

An Electric Conduit Railroad.

The electric railroads of Buda-Pesth are constructed with underground conduits for carrying the current. There are two rails on each side with 33 millimetres between them. On one side of the track the rails are carried in solid cast-iron chairs which enclose the canals for the electric conductors, of which there are two. The motor is carried below the body of the car between two axles, and communicates motion to an axle by an endless chain. The rheostats are divided into four groups and placed under the platform on which the motorman stands. The machine can be cut out of circuit or the motion reversed, and the latter action combined with the brake makes a very short stop possible. The current is of 300 volts. There are 50 electric cars. The speed is ordinarily 15 kilometres an hour, but is not permitted to exceed 10 kilometres in the crowded streets, and is limited to six at the junctions of the great avenues. It is run up to 18 kilometres in certain places. Each car makes from 120 to 150 kilometres in 16 hours' work. The average number of passengers per car-kilometre is 5.88. The receipts per car-kilometre are 1.452 francs and the receipts per passenger are .2472 francs.

Test of Steel.

Under date Nov. 18, Mr. E. J. Snow, of the Ramapo Wheel & Foundry Co., certifies:

"On Aug. 10, I had made two cutters of $\frac{5}{8} \times 1\frac{1}{4}$ steel for boring 3-in. holes in cast-iron car wheels, one being Mushet's and the other an American self-hardening steel.

"The American steel was put in the boring bar first,

and in boring five wheels it was necessary to remove it twice to be ground.

"The Mushet's was then put in the bar and in boring 60 wheels it did not become necessary to remove it at all."

The Transfer Steamer "Ann Arbor."

The Toledo, Ann Arbor & North Michigan transfer steamer was put in commission this week, thus opening the through freight line via the North Michigan and the Green Bay, Winona & St. Paul roads.

The steamer was fully described in the *Railroad Gazette* of Aug. 19. The vessel is the first of two building, and is 267 ft. long on deck, 52 ft. beam and 18 ft. molded depth, drawing 12 ft. of water, with a displacement of 2,550 tons. She has twin screws in the stern and a screw in the bow. The vessel can carry 22 loaded freight cars. The ferry transport is from Frankfort, Mich., across Lake Michigan to Keweenaw, Mich., 60 miles.

East River Bridges.

The New York Board of Aldermen has approved the petition of the East River Bridge Company for power to construct and operate two bridges over the East River with their approaches. This includes an Elevated Railroad across the city to Spring street.

An Elevated Railroad to the Pennsylvania Ferry.

On Nov. 22 Mr. George Gould, Col. F. K. Hain and Mr. Frank Thomson appeared before the Rapid Transit Commissioners of the city of New York to present a scheme, which is not new, but which may possibly be carried out, under existing conditions. It is to build a spur of the Ninth Avenue Elevated Railroad down Cortlandt street, New York, to the Pennsylvania ferry. Mr. Thomson said the Pennsylvania had been asking the Manhattan company for six years to do this and that now the company has for the first time reached a state of mind in which it will favorably consider the plan. It is said that the Commissioners appeared to favor the idea, and really such a line would be a great convenience to very many people. Mr. Thomson said that 52,000 persons cross the Cortlandt street ferry every day, of whom many are Elevated railroad passengers. The Commission was to report on the plan at its meeting of Nov. 29.

Hall Signals on the Southern Pacific.

Hall electric signals, similar to those used at the Pecos River bridge, on the Southern Pacific, have been put in use by the same road at three drawbridges near New Orleans. The style and general arrangement of the signals is the same as on the Central of New Jersey, New York Central, Chicago & Northwestern and other roads, and the applications at New Orleans are arranged to operate the same as at the Pecos bridge. The latter was described in the *Railroad Gazette* of Oct. 28.

Electric Power Transmission.

The department of public works of the city of Neuchâtel has instituted an international competition for designs for an electric transmission plant by means of which the water power at Pré aux Clés is to be made available at Neuchâtel, some 5½ miles distant. Turbines and generators are to be installed at Pré aux Clés, the minimum water power available being 952 H. P., and the maximum 2,800 H. P. The competition will close on Jan. 15, 1893. The prizes offered for the best three designs are 5,000, 4,000 and 3,000 francs. The judges are Dr. Hirsch, of the Neuchâtel Observatory, who is chairman; Prof. H. F. Weber, of Zurich; Prof. Colombo, of Milan; Oscar von Miller, of Munich, and R. W. Picow, of Paris. Full particulars concerning the competition can be obtained from the "Direction des Travaux Publics de la Ville de Neuchâtel."

Duluth Ship Canal Tunnel.

Plans for a tunnel under the Duluth ship canal, for the accommodation of steam railroad and street railroad and wagon and foot travel will be received by the Board of Public Works, Duluth, until Jan. 2. A cash prize of \$1,000 will be paid for the best plans submitted. Henry Truelsen is the President of the Board of Public Works.

An Electric Mine Railroad.

Messrs. Ganz & Co., of Buda-Pesth, the widely known electrical engineers and contractors, recently finished an underground railroad for coal hauling for the North Hungarian United Coal Mining & Manufacturing Company, at Mizerfa-Csibaj. The road is about 1½ miles long, has a gauge of 24.8 in., and has a varying grade of from 2 to 6½ per cent. The cars are run at a speed of about 10 miles an hour. The road is the first of its kind in Hungary. A small electric locomotive, weighing about 4,400 lbs., and rated at 6 H. P., is used to haul the cars, and is confined to 42 in. in width and 56 in. in height, so as to readily pass through the mine headings. A 330-volt electric current is used, the generator being at the foot of the main shaft, and driven by a 40 H. P. steam engine. This generator plant was put in specially with the view to further extension of the electric haulage system, which appears to have met with much favor.

Electric Lighting of Cars by Storage Batteries.

The "Silver system" of electric lighting is now in use on a passenger train of the Atchison, Topeka & Santa Fe and on several trains of the Chesapeake & Ohio, where it has given very satisfactory service for nearly a year. The plates of the batteries are so arranged as to lie flat, and it is believed that this will obviate the difficulties heretofore encountered with other batteries from

failure of the plates, this failure being due chiefly to the jar and vibration, the plates being set so as to rest on their edges. The cars here referred to have each two batteries of six cells placed in a receptacle beneath the floor of the car. Two batteries weigh about 1,000 lbs. Each car is fitted with 10 lamps, eight inside and one for each platform. A battery which has been charged for 10 hours will furnish light for about 17 hours. The cost on the Atchison, for attendance and running expenses, is equal to about three cents an hour for each lamp. It is not stated how many hours in a day the lamps are used.

Cranes.

A pillar crane of fifteen tons capacity has recently been erected in the United States Navy Yard at Brooklyn by The Yale & Towne Manufacturing Company. The load is lifted on a radius of thirty feet, and rotated by means of rotating gear. Standing on the water's edge the crane is mainly used in loading and unloading vessels, and is frequently called upon to handle steel armor plates weighing from ten to fifteen tons.

Old fashioned floating sheer bulks have been supplanted by a new type of floating crane in the Portsmouth dockyard. The new twin screw, self-propelling floating crane is said to be able to lift and swing through an entire circle any weight up to the maximum for which it was designed. After lifting the load on to its own hull, a floating crane is intended to steam from vessel to vessel, to perform whatever hoisting operation may here be required to place the machinery, etc., on board. Three fifty ton boilers were in this manner loaded upon H. M. S. "Blenheim" in the short space of time between nine in the morning and five in the evening.—*Hoisting.*

Wynne's Electric Conduit.

Mr. Frank Wynne, of 9 Victoria street, London, S. W., has been for some years past perfecting a closed conduit system of electric traction, and claims to have at length succeeded in overcoming all difficulties. An insulated cable is laid between the ordinary tram lines, in a hemispherical tube formed by a groove in the bottom of a contact rail of cast iron and a foundation of bituminous concrete. The contact rail is divided up into sections, each of which is completely insulated from its fellows by being laid in bitumen and asphalt. Contact boxes are provided at intervals, in which are electromagnetic contacts, each of which puts two consecutive sections of the contact rail into communication with the main conductor already mentioned. The working of the system is in its essential features as follows: The car has three contact pieces, of which two only are theoretically required, but the third is found to be advisable in practice. The distance between the leading contact pieces is rather more than the length of a section, while the distance between the trailing two of the three contacts is about 1 ft. or so. As already mentioned, the sections of the contact rails are connected to the contact boxes in pairs. As the car moves forward the leading contact piece moves on to one of the sections connected with the next contact box, and, still later, on to the second of these sections. At this moment the middle contact piece moves on to the first section, so that the third contact piece is now the only one taking current from the charged section. The current, after passing through this contact piece, divides, part of it going direct to the motor, while another part of it is shunted through the middle contact piece into the second contact box operating the circuit maker there, and back through the first contact piece to the motor. In this way the different sections of the contact rail are successively switched into circuit as the car passes along. The contact maker is covered by a cast-iron cover, which, acting on the same principle as the diving bell, excludes all water from the switch beneath it. A small secondary battery, which is kept constantly charged by the current, is provided on the cars for starting purposes, as by its means the electromagnetic contact makers can be operated when necessary. The cost of a line on this system is said to be £1,500 a mile.—*The Engineer.*

THE SCRAP HEAP.

Notes.

It is generally hoped that the World's Fair will not be in any way eclipsed by the railroad fare.—*Washington Star.*

Three of the men who attacked a train of the East Tennessee, Virginia & Georgia, Oct. 31, have been arrested near Piedmont, Ala.

There has been a small strike of switchmen on the Colorado Midland at Aspen, Colo. The company had to get the protection of the sheriffs.

The Ft. Worth & Denver road has sunk an artesian well at Rhine, Tex., to get water for locomotives. It has now reached a depth of 1,400 ft. Good water has been found, but it will probably have to be pumped to the surface.

A fire in the works of the Michigan Forge & Iron Co. at Detroit, Nov. 25, caused a loss of \$50,000. The works are controlled by the Michigan Peninsular Car Co. The loss was on the buildings and light machinery. The heavy machinery was not seriously damaged. The loss is fully covered by insurance.

Trains on the Columbus & Western Railroad will run through to and from Birmingham on and after Dec. 4. This part of the road has been idle for about six months on account of the caving in of the Coosa tunnel. The relining of the tunnel with brick has now been finished. The Oak Mountain tunnel has also been lined in the same manner.

A sleeping car in a Northern Pacific train was robbed near Hot Springs, Wash., on Nov. 24 by three masked men who intimidated the passengers, took most of their money and jewels, and escaped before the trainmen knew what was going on. On Nov. 25 a passenger train of the Ohio River Railroad was boarded by roughs at Huntington, W. Va., who threatened the passengers' lives, and finally started a fight in which the conductor and the other trainmen and several passengers were badly injured.

The application of the telegraph operators of the

Queen and Crescent system for an increase of pay has resulted in an order from General Manager Carroll prescribing certain regulations not heretofore in force. The desired advance in pay seems not to have been granted. The General Manager's order provides for a maximum working day of 12 hours, but where the work is light the 12-hour term may not be continuous. Overtime will be paid for pro rata, but not over \$5 in any one month. An operator called for special service will, however, receive 25 cents an hour (minimum 25 cents for each call) and this allowance is to be paid even if the aggregate overtime is more than \$5 a month. An operator dismissed may appeal to the Superintendent within five days, and his appeal will be investigated within 10 days thereafter. There shall be no discrimination against members of the Order of Railroad Telegraphers. The telegraph operators of the Baltimore & Ohio, who have been negotiating for an increase of pay in accordance with an application presented several weeks ago, have secured an aggregate of \$35,000 a year, which is said to be about one-quarter what was asked. It appears that the distribution of this gross amount was left by the General Manager to be agreed upon by the Superintendent of Telegraph and the committee of the operators.

World's Fair Notes.

Work has commenced in driving piles and erecting steel pillars for the Krupp gun exhibit.

The Krebbel Palace Car Co. has applied for track space, 450 ft. long by 10 ft. wide, in the Department of Transportation, to show six passenger cars, each 75 ft. long, and readily convertible into parlor, sleeping or dining cars.

The Jackson-Sharpe Co., of Wilmington, Del., has entered, as transportation exhibits, 65 open passenger cars to be operated on the intramural railroad on the Exposition grounds. Eighteen of these will be equipped with electric motors.

New Brooklyn Electric Railroad.

The certificate of organization and incorporation of the Kings County Electric Railway Co. was filed at Albany this week. The company's capital is \$650,000, to be used for constructing a surface road in Brooklyn and vicinity 16 miles long. One terminus is at Thirty-ninth street ferry and the other at Union street in the Twenty-sixth ward; another is at Cooper avenue in the Eighteenth ward. The directors are James F. Casey of Albany, Michael Bergen of Paterson, N. J., Frank S. Roake, George A. Bryan, George Daman, James W. Knox, R. H. Flynn, of Brooklyn, and Joseph E. Sullivan and James Jackson, of New York.

New Material for the Prussian State Railroads.

The Prussian State Railroad Administration has published a budget of its requirements in new rolling stock for the financial period 1893-94, according to which 371 locomotives, 217 passenger carriages and 3,038 freight cars are to be purchased. It is, however, probable that this number will be increased, as for the year 1892-3, instead of the 29 engines, 200 carriages and 2,800 trucks officially given, the respective numbers which will in due course have actually been acquired are 404, 414 and 3,993. The Administration has just invited tenders for 216 locomotives.

Grade Crossings to be Abolished in Boston.

The city of Boston has filed petitions in the Suffolk County Superior Court, asking that grade crossings on 20 of the most important thoroughfares in that city, still unprovided with bridges, be done away with. The defendants named in the petitions are the Boston & Albany, Old Colony, New York & New England, Boston & Lowell, Eastern, Fitchburg and Boston & Maine railroads. The streets affected are Clyde, Marginal, Webster, Sumner, Maverick, Prescott, Bennington, Saratoga, Curtis and Decatur, all in East Boston; Rutherford avenue, Main and Chelsea streets, in Charlestown; Dudley street in Dorchester; Congress, A, West First, Dorchester avenue and Northern avenue, in South Boston. Under the law the state pays 25 per cent. of the cost and the railroad companies and the city the balance, to be apportioned by a special commission. In most cases under this law the railroad companies have paid 65 per cent. and the town or city 10 per cent.; but these cases have been mostly in country districts, where the land damages were comparatively light.

Mr. Corbin's Tunnel Again.

Mr. Austin Corbin has revived his scheme for an East River tunnel from the Battery to the foot of Atlantic avenue, Brooklyn. Mr. Corbin says that work on his tunnel, which is intended as an entrance for the Long Island Railroad to New York City, will begin within a year. He estimates the cost at \$3,500,000.

Elevation of Tracks at Elizabeth.

Work on the Pennsylvania elevation at Elizabeth, N. J., is going on steadily. The trestle has been erected from South Elizabeth to the Broad street crossing, and is about ready for the rails. Work on the piers of the street crossing bridges at Cherry and West Grand streets and Magnolia avenue is progressing rapidly. The request of the Morris avenue property owners for an iron bridge instead of the stone arches proposed for the Morris avenue Broad street crossing is not likely to be granted, and the railroad company is going on steadily with the work on the foundations for the stonework proposed in the original plan. A large force of men is at work all along the line, and it is expected that trains will be running over two tracks of the elevated structure by Jan. 1, 1893.

A Union Depot for San Francisco.

The San Francisco Depot Act, another matter upon which the people voted affirmatively at the recent election, provides for the construction of a union depot at the foot of Market street, the great artery of the city, the place where all the new comers land and where lines of travel chiefly focus. At present the city owns a rather unusual collection of cattle sheds, new and old, but all alike disgraceful, unhealthy and abominable. It is not only that a visitor landing here gathers dirt, discomfort and bad impressions of San Francisco, there are thousands upon thousands of residents, men women and children, who cross the ferries daily, and so bleak are the damp, wind-swept sheds that the physicians must reap a rich harvest. The Depot Act provides for the issuing of bonds, to be paid from the toll receipts of the Harbor Commission. The

rents of the proposed depot, which is to be thoroughly modern, will so increase the income of the Commission that the building will practically pay for itself. The thick and thin anti-railroad organs foolishly opposed this Depot Act, on the ground that the Southern Pacific would occupy most of it. But as that company and others are forbidden by law to own a part of the water front and to build their own depot, it is difficult to comprehend the logic of those who wished to prevent San Francisco from having any depot at all. As I have said, the voters were strongly in favor of the improvement.—*Correspondence New York Evening Post.*

Contractors' Claims on the Oxford & New Glasgow.

The result of the conference of the contractors for the Oxford & New Glasgow Short Line of the Intercolonial, which was built by the Canadian government, Mr. Haggarty, and Mr. Schreiber, Chief Engineer of the Canadian Government railroads, as to the difference in quantities allowed and claimed on these contracts, has been an agreement to refer the claims to a civil engineer for decision. Mr. Schreiber suggested the name of Hiram F. Donkin, C. E., as arbitrator, and to this the contractors readily agreed. Mr. Donkin is one of the most experienced railroad men in the Dominion both as an engineer and contractor, and has acted in disputes of a similar character on several important Canadian Pacific contracts. He was the engineer in charge of the Cape Breton Railroad from its survey to its completion. His decision as to the measurements to which the contractors are entitled will be accepted as final, and on the basis of these quantities the claim for higher classification for the "hard pan" excavation will be adjudicated by the Exchequer Court.

Reading Earnings \$700,000 a Mile.

On Saturday night and Sunday last the Philadelphia & Reading Railroad moved sixty-five coal trains from the mines in the Schuylkill region down its main line to tidewater. Each of the trains averaged 60 gondola cars, or, in all, 3,900. Each car carried an average of 28 tons, making a total of 109,200 tons, for each ton of which the company gets \$1.90 main-line tolls, or, in all, \$207,480, which the purchaser pays. In addition there is a charge of 30 cents a ton for lateral tolls, or, in all, \$37,200, which the operator pays. The railroad, therefore, earned a grand total for the day's coal traffic of nearly \$250,000. This was in addition to the regular passenger and freight business.

Press dispatch.

The sum of \$200,000 a day equals seventy-three millions a year. Estimating the distance from the mines to tidewater as 100 miles we find that this movement, if kept up, would produce an income of \$730,000 a mile, a year; which is nearly thirty times as great as the earnings of the busiest roads in the country. By eliminating the fee, the press bureau of the Reading ought to be able to make a news item which would "go like hot cakes" among the country papers.

Malleable Iron.

Mr. Joseph A. Crawford publishes the following notes on a new patent process of melting and puddling with various mixtures to produce the best malleable iron: "Charge 9½ cwt. of forge pig iron, 7½ cwt. of hematite, with 100 lb. coke, at various stages into 10-ton cupola, for 10 to 15 minutes, time allowed for melting; to follow on charging with 3 cwt. of cinder pig iron and 5 cwt. of malleable scrap iron, with 48 lb. of coke. After all is melted down to be run off the receiver connected with the cupola into a narrow ladle, which can be run alongside the puddling furnace and turned into the furnace for the puddler to work, which will take the short time of three-quarters of an hour for balling, etc. One 10-ton cupola will melt iron to 50 puddling furnaces on eight hours' shift and allow half an hour for fettling."—*Iron.*

Chignecto Ship Railway.

It is announced in the Canadian press that contractors Ross, Holt & Mann have been asked to undertake the completion of this work. It is reported that the firm has agreed to complete the work under certain conditions, which at present are not generally known, and that an English banker, interested in the company, who has been in Canada has returned to London, and if the financial conditions imposed by Ross & Co. are complied with, and it is believed they will be, the work will be carried to completion.

The Congo Railroad.

A late number of the *Sun* (New York) contained a letter from Cyrus C. Adams stating that the first 10 miles of this railroad, from Matadi, 90 miles above the mouth of the Congo, to Palaballa, is completed after about two years of organization and labor, which were preceded by two years of surveying. Matadi is at the foot of the whirlpool below Yellala Falls and from there the railroad winds along a steep side hill until it enters the Leopold ravine which it ascends to the Palaballa plateau, 1,000 ft. above the sea. Track laying is progressing at the rate of about a mile in seven days and excepting a few bridges, one 330 ft. long, no obstruction or heavy work is expected. The length of the line to Stanley Pool is to be 235 miles. There it will connect with a steamboat navigation of some 6,000 miles on the Congo and its tributaries. The estimated cost of the road and its equipment is \$5,000,000, and a remunerative income is greatly dependent on the possibility of growing cotton, with possibly coffee and tobacco, for neither ivory nor India rubber will apparently afford sufficient freight.

The Blowing Up of an Oil Ship.

The ship "Norcross," with oil from Philadelphia for Rouen, grounded on Nov. 7 at the mouth of the Seine, and shortly afterwards blew up, with fatal results to several of the crew. The captain of the tug accompanying the "Norcross" has made the following report: "I heard a tremendous explosion on board the 'Norcross,' and saw enormous fragments of that vessel's decks hurled up as high as her topgallant yards. The whole of the vessel was immediately enveloped in the smoke and flames following the explosion, which had no doubt been caused by inflammable gas coming off from her cargo. I stopped, cut the 'Norcross' adrift, and did all I could to save life with my small boat. We first picked up two sailors who had been hurled overboard by the explosion. One had received burns on the stomach, head, face and hands; while the other, whose hair and face were also burned, had, besides, a large wound on the forehead. My boat afterwards got alongside the ship, near the stern, from which we rescued the captain, his wife, the pilot, one sailor and the cook, all of whom were slightly injured. From the forepart of the ship we afterwards rescued a sailor, more seriously injured, who had taken refuge on the bowsprit. Being then convinced that the remainder of the crew had been killed, either by the explosion or the flames, we made for Honfleur, where we landed the survivors."

The Victoria Bridge.

A Mr. W. B. Jeffries, who, according to the *Railway News*, is visiting Canada in the interest of himself and other stockholders of the Grand Trunk, said of the Victoria Bridge, that it has become patent that as the bridge stands to day it cannot serve the traffic demanded of it. Mr. Jeffries, who stated that the first cost of the bridge was about six millions sterling, thought that it would be just about as cheap to build another bridge as to enlarge the present one.

Pintsch Gas in the Thirsk Accident.

Immediately after the Thirsk accident on the North-eastern of England, in which the wrecked cars were burned, the story was started that the fire was due to the Pintsch gas with which the cars were lighted. We have just received the following letter, dated London, Nov. 17, which probably sums up correctly the conclusions from the Board of Trade investigation.

We beg leave to call your attention to the report of the Board of Trade inquiry on the above accident, and to remind you that as the four following points have been established the compressed oil gas had nothing whatever to do with the burning of the coaches.

1. That immediately on the collision the whole of the gas lights on the train were immediately extinguished.
2. That a few moments after the collision the whole of the gas had escaped from the receivers, either by having the brass fittings torn off or by the receivers themselves being damaged.
3. That three-quarters of an hour after the collision took place there was no sign of the gas having produced any fire whatever.

4. That about an hour after the collision happened the live coals which had been shot out of the firebox of the locomotive on to the nearest coaches caused them to catch fire.

We enclose a couple of extracts taken from one of our most careful and critical weekly papers, from which you will see how even thoughtful persons may be led away by first impressions, and have to correct them afterwards.

"The Thirsk accident illustrates very painfully what must have struck many people—the extreme danger of the modes of lighting trains which modern demand for luxury and ease has forced upon railway companies. Whether it is impracticable to light trains by electricity we cannot say, but it is quite certain that either gas or petroleum makes a conflagration the almost necessary sequel to a collision."—*Saturday Review*, Nov. 5.

"Again, another amateur declares that the gas with which the carriages were lighted exploded and set them on fire, and that he always knew it would; and that gas lighting ought immediately to be put a stop to. It now seems pretty clear that the fire came, in fact, not from the gas receivers, but from the firebox of the locomotive."—*Saturday Review*, Nov. 12.

These extracts show not only what the writer of the letter says they show, but also a very silly want of candor on the part of the *Saturday Review*. Few of its Yankee contemporaries could have been so "naughty" in making a correction.

Good Scheme for Engineers' Use in Signing Train Orders.

The daktograph, or thumb-written ticket, is the outcome of a Detroit genius's efforts to defy the scalper. It is well known that the lines in the cuticle of no two thumbs are alike. The inventor of the new ticket takes advantage of this fact by requiring the purchaser of an iron-clad ticket to make a print of his thumb in a blank space at one end reserved for this purpose. The extremity of this space, which is about three inches long, is gummed, so that after the thumb signature is made the end of the ticket may be folded over, hiding the signature from view. On the return journey the conductor opens the gummed end, exposing the imprint of the thumb, and requires the holder of the ticket to make another imprint of his thumb alongside the first for identification. The conductor is expected to carry a little pad of coloring matter to enable the passenger to perform this duty. It is not stated whether the railroad will require its representative to carry a wash-basin for cleansing the thumb after being used as a stamp.—*Exchange.*

M. Haguet and the International Railroad Congress.

The editor of *Le Journal des Transports* (Paris) was not invited to the International Railroad Congress at St. Petersburg, and naturally he feels badly about it. Properly so, too, for his paper has long had a unique and well recognized position among the European railroad journals. He does not propose to let the matter pass without a protest and has received a letter from the President of the Commission, M. Belpaire, and from the Secretary, M. L. Weissenbruch, in which he is informed that the Russian Local Commission issued the invitations to the press, which were limited in each country to two or three journals selected by that Commission. The President and Secretary have informed M. Haguet, the editor, that they received the necessary powers to correct any omission should complaints come to them, and they say: "It would have been sufficient for you to have made known to us your wish, which would have been complied with at once."

Concerning this letter M. Haguet says: "The letter of the International Commission is skillfully designed to transfer the discussion and to exonerate Paul by blaming Peter. According to this letter, the guilty ones are the Russian Commissioners who organized the fourth session. The snare is too visible. To get the satisfaction that is due to us I should be compelled to begin again the siege of Sebastopol and perhaps—oh! sacrilege—to show the ridiculous aspects of the holy Franco-Russian alliance, which the diplomacy of His Excellency Raffalovich transfigures so gently into our veins, and which the hot harangues of M. Noblemaire help to consolidate. I have not the courage to betray my friends so far, so let us stay in Belgium and fix there the responsibility. The International Commission at Brussels received the necessary power to supply any omissions, but it never acknowledged the request sent to it through Mr. Alfred Picard, Vice-President of the Commission, which request placed the *Le Journal des Transports* among the French journals which ought to be invited. Perhaps this request, coming from such a high source, was not enough for the Secretary-General, and perhaps he was waiting for some supplication from us. He was mistaken; we hold a pen and not a beggar's cup in our hands."

Water Supply for Jersey City.

Mr. George B. Inman of New York has handed in a proposition to the Street and Water Commissioners of Jersey City to provide for that city a new water supply. He proposes to furnish water for \$33.50 a million gallons for 5 years and \$21.00 for the next 20 years. He would make a 20-year contract and lay a main 6 ft. in diameter. His proposition is indorsed by Messrs. Drake & Stratton and Coffin & Stanton of New York, by President Roberts of the Pennsylvania, President Newell of the Lake Shore and various other solid men.

Moffett, Hodgkins & Clarke have also presented a bid to supply water from the Rockaway River, below Boonton, at \$40 per million gallons up to 22,000,000

gallons daily; \$36 for each million from 22 to 25 million gallons daily; \$34 for each million from 25 to 30 million; \$31 for each million from 30 to 35 million, and \$25 per million for each million gallons above 35 million gallons daily. It is claimed that specifications were so drawn as to shut out other intending bidders, and it is a fact that the bid of Moffett, Hodgkins & Clarke is the only one meeting the requirements of specifications as drawn. In consequence a strong opposition has developed, and the Board of Trade has recommended that the contract be again offered for bids under amended specifications. It does not seem probable that any award will be made at present. Other parties have expressed a willingness to bid if specifications are so drawn as to admit of it.

Harlem Drawbridges.

The New York Park Board has passed a resolution to the effect that the Madison avenue and Third avenue bridges over the Harlem shall not be opened between 6 and 10 o'clock a. m., and 4 and 7 o'clock p. m., after Dec. 20. This, of course, is subject to the action of the War Department.

Improvements at Harper's Ferry.

The Baltimore & Ohio now has 400 men at work on the tunnel at Harper's Ferry, W. Va., and as many more will begin this week on the Virginia side of this improvement. Four piers of the bridge over the Potomac river are above the water. The improvements being made were described in the *Railroad Gazette* of Nov. 4.

An Old Bridge.

Chesford Bridge, over the Avon, in England, on the road between Leamington and Kenilworth, is being replaced by the County Council. The bridge dates from before the reign of Edward I., and its two old arches will be incorporated in the new bridge.

New Passenger Station at St. George.

Plans have been completed for a large station to be built by the Baltimore & Ohio at St. George, Staten Island. The plans were prepared by Baldwin & Pennington, of Baltimore. Bids for this work will be asked for in a few days, and the construction will be rapidly pushed as soon as the contract for the work is awarded. The cost of the new station is estimated between \$100,000 and \$150,000. The building of this station is part of the improvements contemplated by the railroad company in the development of its terminal facilities at Staten Island.

The Chesapeake & Ohio Steamship Co.

This steamship line between Liverpool and Newport News was organized in London on Nov. 15. The title is "The Chesapeake & Ohio Steamship Co., Limited." The capital is furnished by English parties and those interested in the Chesapeake & Ohio Railroad. Among the American directors are M. E. Ingalls and Decatur Axtell of that company. Six first-class vessels are to be put on as soon as practicable. The owners of the Chesapeake & Ohio Railroad, it is understood, will control a majority of the stock of the new association.—*Richmond (Va.) press dispatch.*

Lake Superior Ore Shipments.

The shipments of ore from Lake Superior points, contrary to expectation, have far exceeded last year. From Two Harbors shipments are still being made and new contracts have been made, that will keep the docks busy until December 1st. The total shipments for the season from Ashland were, on November 17th, 2,305,550 tons, an excess of 652,107 tons over 1891, and 31,034 tons over 1890, which was the banner year of this port. In 1891 the last cargo left on November 2nd, but this year the season will not close until December 1st.

Only two cargoes of ore from the Mesaba range were shipped this year. Both of them were from the Mountain Iron Mine and one of them was consigned to the Carnegie Steel Co. and the other to the Isabel Furnace, at Pittsburgh. The result of the furnace tests of this ore will be watched closely by the iron and steel manufacturers of the country.

Cape Tormentine Breakwater.

The breakwater and pier works at Cape Tormentine, New Brunswick, are now completed. The present contractor, Edward Murphy, of Toronto, began work on the pier in the spring of 1888. The pier has three parts. The main section projects out into the straits in an easterly direction 2,500 ft. Then a section runs at right angles to this in a southerly direction, 400 ft., when another angle occurs and there is a section of 400 ft., running toward the shore, parallel to the main pier. The structure is partly stone and partly crib work, have has already been injured by the terebdo.

Freight Cars for Egypt.

Complete particulars have just been published of the tenders that were recently received by the Egyptian Railways Administration for the supply of 250 wagons, the order for which, it will be remembered, was ultimately booked by a Belgian firm, the Société Baume-Marpent. In view of the keenness of the competition for the commission, it may be interesting to reproduce the following table, from which it will be seen that six Belgian firms head the list, according to the modesty of their demands. Then follow in succession, with the exception that one German concern is inter-sandwiched, eight English works; the remaining would be contractors, with quotations of greater or less divergence, comprising French, Austrian, English, German and Belgian firms.

France.	France.
Baume-Marpent.....	418,500
Société Métallurgique.....	432,000
Société Dyle et Bacalan.....	440,000
Société de Morlanwelz.....	449,000
Société de Malines.....	450,000
Société Franco-Belge.....	452,900
Ashbury Carr. & Wag. Co.....	468,850
Midland Carr. & Wag. Co.....	481,250
Bristol Wagon Co.....	481,875
Brown, Marshall & Co.....	494,375
Vander Zypen et Charlier, Deutz.....	495,000
Burlington Wagon Co.....	495,975
Odinary Carr. & Wag. Co.....	491,825
France.	
Laconcar Carr. & Wag. Co.....	512,500
Birmingham Carr. & Wag. Co.....	528,125
Société de Braine-lez-Louvain.....	531,500
A. Gorman.....	541,000
Metropolitan Carr. & Wag. Co.....	543,022
Bonnefond.....	543,300
Gloucester Wagon Co.....	586,875
Messrs. Mac Lellan.....	606,250
Görlitz Works.....	606,250
Cottian Works.....	700,000
Société Générale de Saint Dupis.....	756,250
Breslau Works.....	797,500

The discrepancy between the minimum and maximum offer is rather considerable, amounting to nearly 100 per cent. One continental firm, moreover, is said to have seriously written to the Administration stating its willingness, under certain conditions, to supply the 250 vehicles for a sum of 1,237,500 francs! This generous offer must surely have been overlooked by the Egyptian directors.—*Iron.*

Rapid Transit.

Mr. Westinghouse has done a cruel and needless thing in going out of his way to try to destroy humanity's hope of being shot along the ground at a speed of 100 miles an hour. The difficulty lies in making, with sufficient promptness, those unscheduled stops necessitated by open switches, missing bridges and the various obstacles that industrial discontent is wont to grace the track withal. Even on a straight line—what the civil engineers find pleasure in calling a tangent—the contented industrialist at the throttle valve cannot reasonably be expected to discern these hindrances at a greater distance than 1,000 ft.; and Mr. Westinghouse sadly confesses that in that distance his most effective appliance could do no more than reduce the rate from 100 miles an hour to 50—an obviously inadequate reduction.

All this begets an intelligent dejection. If we must renounce our golden dream of cannonading ourselves from place to place with a celerity suitable to our rank in the world's fauna—comprising the shark, the humming-bird, the hornet and the jackass rabbit—civilization is indeed a failure. But it is forbidden to the wicked pessimist to rejoice, for there is a greater than Mr. Westinghouse and he confidently affirms his power to bring to a dead stop within its own length any train however long and however fast it may be going. This ingenious gentleman, upon whom it is hardly too much to say the hopes of civilization rest, lives in Missouri, and his name is Jowers. He has not as yet seen fit to describe his invention to anybody but an unknown clerk in the Patent Office, but he seems to have found certain well-to-do persons who are willing to "stake" him in its manufacture and introduction. It is not wise, however, to indulge too high a hope. Approaching an evidence of industrial discontent at the rate of one-and-two-thirds miles a minute in a train equipped with even the Jowers' brake may not be the picnic that one might think it, or that Mr. Jowers, thinking through his hat, as it were, might represent it.

But this point can be best illustrated by recalling to the reader's memory the history of the Gargaroo & Gallywest Railroad in Bumbassa. As is well known, the trains on that road attained a speed that had not theretofore been dreamed of, and the secret of which perished with the illustrious projector. But the King of Bumbassa was not content; he insisted upon instantaneous stoppage. To the royal demand the clever and prudent gentleman who had devised and carried out the enterprise responded, with an invention which he assured his Majesty would accomplish the desired end. A trial was made in the monarch's presence, the coaches being loaded with his chief officers of state and other courtiers, and it was eminently successful. The train, going at a speed of 70 miles an hour, was brought to a dead stop within the length of the rhinoceros catcher and directly in front of the blue cotton umbrella beneath which his Majesty sat to observe the result of the test. The passengers, unfortunately, did not stop so promptly, and were afterward scraped off the woodwork at the forward ends of the cars and decently interred.

The King then commanded the Projector to invent a method of stopping the passengers and trains simultaneously. This was accomplished by fixing them to the seats by clamps, but no provision being made for the head a general decapitation ensued at each stop, and people who valued their heads preferred to go afoot. It was found, moreover, that, as arrested motion is converted into heat, the royal requirement frequently resulted in igniting and consuming the trains, and sometimes the stations and adjacent buildings.

These various hard conditions of railroading in Bumbassa eventually subdued the spirits of the stockholders, drove the Projector to drink and led at last to withdrawal of the concession—whereby one of the most promising projects for civilizing the Dark Continent was knocked perfectly cold. We have thought it worth while to recall its melancholy history here for its general usefulness in pointing a moral and for its particular application to the fascinating enterprise of a one-hundred-miles-an-hour electric road from St. Louis to Chicago—a road whose trains, intending passengers are assured (probably with Mr. Jowers in mind), will be under absolute control of the engineers and "can be stopped at a moment's notice." If we have said anything to discourage the enterprise we are sorry, but really it is not easy to understand why anybody should wish to go from St. Louis to Chicago.—*San Francisco Examiner.*

Dredging Gowanus Bay.

On account of irregularities in the bids for dredging Gowanus Bay, New York Harbor, the War Department has decided to readvertise for this work. Three proposals were received in answer to the first advertisement, and the contract was awarded to the International Dredging Co., the lowest bidder. The W. H. Beard Dredging Co., contested the award.

Saving a Cargo of Rails.

A large portion of the steel rails comprising the cargo of the ship "Aberdeen," wrecked on the weather beach north of Gray's Harbor, Wash., four years ago, was recovered before work was stopped two weeks ago. A wharf 1,500 ft. long built out from high water mark to the wreck, terminating in a Y, the arms 150 ft. long and 175 ft. apart at the outer extremities. These half surrounded the vessel, which lay in six fathoms of water. Four divers fastened chains to the rails, which were hoisted by engines. The value of the recovered cargo is about \$80,000, and \$20,000 worth of rails still remain in the wreck, to be taken out next spring.

The Thirk Railroad Disaster.

A Board of Trade inquiry into the disaster near Thirk was opened on Friday by Major Marindin. . . . A meeting of signalmen employed on the Northeastern was held at Newcastle on Sunday afternoon when the Thirk disaster was considered. The chairman said the subject of relief for signalmen demanded attention. If the relief which Signalman Holmes properly applied for had been granted the accident would not have happened. He denied that the refusal of relief to Holmes was an isolated case. It was rather common and customary for signalmen to be refused relief, and many a man had been compelled to perform his duty in his cabin and leave his near relatives to be buried by strangers. . . . Great pressure was put upon signalmen to get the traffic through. The company had been compelled to shorten the hours of the men generally, and they were trying to make it up by putting pressure on the signalmen to get the traffic through in less time. No doubt many signalmen were familiar with inquiries demanding why this and that train did not get through. He had himself been asked why he did not get a heavy goods train through between two sections of a Scotch express when there was only a margin of about 12 minutes. It was the pressure that was brought to bear upon signal-

men that had something to do with the mineral train being on the line in this case.

Several correspondents have drawn attention to the way in which Pullman cars, owing to the exceptional strength of their construction, escape the fate of other carriages in collisions. Mr. F. Wicks says that "these cars have been running on a few lines in this country for about 15 years, and, although they have been in many collisions, not a single death has occurred in them except that of a man who set himself on fire in his bunk in circumstances that might have occurred in any hotel or private house." Other correspondents urge that the adoption of the automatic electric signals, now used in the Isle of Wight, would have made the accident impossible. . . .—*London Times, Nov. 11.*

LOCOMOTIVE BUILDING.

The Chautauqua Lake Road will soon order two new engines, to be delivered in February.

The Duluth & Iron Range will soon award the contract for building 20 heavy freight engines.

The Rhode Island Locomotive Works have about completed the three double-bogie engines for the Mexican Central. These are Johnstone compound locomotives, duplicates of the engine illustrated in the *Railroad Gazette*, of March 25 last.

CAR BUILDING.

The Lake Shore & Michigan Southern has just finished at the Cleveland shops a very complete air brake instruction car.

The Delaware & Hudson Canal Co. has let the following contracts: 100 box cars to Murray, Dougal & Co., of Milton, Pa.; 250 hopper gondola cars to the Jackson & Woodin Mfg. Co., of Berwick, Pa.; and 250 hopper gondolas to the Buffalo Car Mfg. Co.

The New York, Lake Erie & Western car shops at Smith street, Buffalo, are busy with a large amount of new work and repairs. The force now comprises 800 men, all on full time. The shops are turning out 12 new box cars each week and have on hand an order for 24 cabooses and 50 platform cars.

The Buffalo Car Mfg. Co. is working full time with a large force on several large orders. The company has an order for 200 gondolas for the Buffalo, Rochester & Pittsburgh and 10 cabooses for the same road. Several large orders which will keep the works busy until well into next year are about closed.

BRIDGE BUILDING.

Baltimore, Md.—The contract for rebuilding the Back River bridge at Eastern avenue was awarded to James P. Jones, of Bengies Station, Twelfth District, whose bid was \$3,976. The total cost of the bridge will be about \$6,000.

Boston.—The Massachusetts Railroad Commission has approved the plan submitted by the Old Colony road for separation of grades at its crossing of West Fourth street, South Boston. The change involves the building of an iron bridge over Fort Point channel.

Henricks, W. Va.—The abutments for the new bridge over Black Fork River at this point are about completed and the steel for the superstructure is being delivered. The Pittsburgh Bridge Co. is doing the work.

Hull, Ont.—The site for the proposed bridge over the Gatineau river is now being surveyed and tenders will be called for and construction will shortly be commenced. It will cost \$30,000. The town of Hull, Ont., will contribute \$15,000; East Templeton, \$5,000; West Templeton, \$5,000, and the other townships \$5,000.

Middlebourne, W. Va.—The King Iron Bridge Co. is erecting a two-span highway bridge over Middle Island Creek, at Middlebourne, Tyler County, W. Va. The new bridge takes the place of a wooden structure.

Milwaukee, Wis.—The plans for the construction of the Holton street viaduct, which it was expected would be under contract this fall, have been delayed still further and it is unlikely that any work will be done before next spring, and bids will probably not be called for before May next. The city is now endeavoring to obtain right of way for the structure.

Minneapolis, Minn.—The Great Northern has awarded the contracts for the superstructure of the highway bridge at Main street to the Edge Moor Bridge Works. The next contracts to be let are for the bridges at University avenue and Fifth street, N. E.

Oliver's Ferry.—The tender of James Summers, of Ottawa, for the construction of the swing bridge at Oliver's Ferry, has been accepted. The old bridge will be torn down and a new structure with iron superstructure will be erected.

St. Paul, Minn.—The masonry for the steel highway bridge at Payne avenue across the tracks of the Chicago, St. Paul, Minneapolis & Omaha railroad is completed. The material for the superstructure is to arrive this week, and the bridge will be in place by Dec. 15. The Lassig Bridge Co., of Chicago, are the builders.

Wilkesbarre, Pa.—Last week work was begun by the Edge Moor Bridge Co., of Wilmington, Del., on the iron work for the new Wilkes-Barre & Eastern railroad bridge at the upper end of the city and it will all be in position in 60 days. The stone work has been finished by Contractor Hendler. The Wilkes-Barre & Eastern Co. will also erect a bridge over the Lehigh Valley tracks near Yatesville, to avoid instead of crossing at grade.

Western New York & Pennsylvania.—The company this year has spent \$71,612.50 in replacing 17 old bridges. This policy will be continued next year, when 21 new iron bridges will displace the same number of wooden structures, at a cost of \$82,541. Some of the new bridges are costly structures. One at Mount Morris, N. Y., built last year, cost \$17,325, and another at Portage, N. Y., now under contract with the Pencoyd Co., is to cost \$30,810. Substantial bridges have been erected at Titusville, Pioneer, Petroleum Creek, Warren, Oil City, Turtletown, and other points on the Pittsburgh division, costing from \$12,500 to \$27,144 each. The policy of replacing the old wooden bridges with iron structures has been pursued for several years. During 1888 two wooden bridges were replaced with iron at a cost of \$15,248. In 1889 six new bridges, costing \$62,794, were erected, and

in 1890 five more were added by an expenditure of \$29,023. Last year, six iron bridges, costing \$67,643, took the places of the same number of wooden structures.

Williamson, W. Va.—Plans are preparing for a highway bridge over the river from Williamson, Logan County, W. Va., to the Kentucky side of the river. The bridge is to be 175 ft. long with a 60 ft. approach on the West Virginia side, and a 40 ft. viaduct on the Kentucky side. It will have a 16 ft. roadway and sidewalks and is estimated to cost \$15,000. T. Boggess, Jr., of Ashland, Ky., is the engineer.

Winnipeg, Man.—At the last meeting of the Board of Works a by-law referred to the committee by the council, was considered. This related to the raising of \$54,000 for the erection of a bridge across the Assiniboine at Main street. It was recommended to the City Council that \$65,000 be added to the by-law to provide for the erection of a bridge across the Red river in the north end of the city. This will make the by-law \$119,000, which the electors will be asked to vote on next month at the municipal election for the construction of two new bridges.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Lowell, semi-annual, 3½ per cent., payable Dec. 3.
Chicago, Burlington & Quincy, quarterly, 1½ per cent., payable Dec. 15.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Atlantic & Pacific, annual, Boston, Mass., Dec. 8.
Housatonic, annual, Bridgeport, Conn., Dec. 20.
Lehigh & Hudson River, annual, New York, Dec. 5.
Rome, Watertown & Ogdensburg, annual, New York City, Dec. 28.
Temiscouata, annual, Quebec, Can., Dec. 6.
Ulster & Delaware, annual, Rondout, N. Y., Dec. 6.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Railroad Club* holds regular meetings at the United States Hotel, Beach street, Boston, Mass., on the second Wednesday of each alternate month commencing January.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Hookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* holds regular meetings on the third Thursday in each month, at 7:30 p. m., at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, N. Y.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at Wesleyan Hall, Bromfield street, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets

at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The *Tacoma Society of Civil Engineers and Architects* holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

The *Association of Engineers of Virginia* holds regular meetings at Roanoke, on the second Saturday in each month, at 8 p. m., except the months of July and August.

The *Engineers' and Architects' Club of Louisville* holds regular meetings on the second Thursday of each month, at 8 o'clock p. m., at its rooms in the Norton Building, Louisville, Ky.

Central Railway Club.

The Central Railway Club met Nov. 23 at Buffalo, President Chamberlain in the chair.

LOCAL INTERCHANGE OF CARS.

The rather time-worn subject of carding cars for local delivery was again taken up. Mr. Waitt moved that the Superintendents be notified it was the sense of the Club that the special carding of cars in interchange at Buffalo by the Club would not be binding upon any company, and suggested that the matter was one that should be taken up locally between the various roads. Mr. Griffith objected to this manner of dropping the subject, and urged that the Club was competent to co-operate with the Superintendents and devise some plan for overcoming the difficulty complained of. It was a courtesy due to the other association. President Chamberlain agreed with this opinion, and called attention to the objections which had been heretofore raised. Mr. Waitt's motion was carried by a vote of 7 to 2, and the special committee discharged.

PUBLICATION OF CLUB PROCEEDINGS.

Secretary Spear from the special committee on the proposed publication of the club proceedings in pamphlet form reported that sufficient advertisements could be had to cover the expense. Mr. Griffith said that the members were sufficiently well satisfied with the manner in which the proceedings were published in the *Courier* and there was no occasion for adopting any new method. Mr. Mitchell favored the pamphlets because the proceedings could be better preserved for future reference. Mr. Waitt complimented the newspaper report, but believed that a stenographic report in pamphlet form would be more satisfactory for the reason expressed by Mr. Mitchell. He moved that such publication be begun with the January meeting. Mr. Rood and Mr. Barnard, on behalf of the supply men, said that they thought they would receive ample returns for the advertising and they would be glad to contribute. Mr. Waitt's motion was carried by an almost unanimous vote.

HOME DEFECTS ON FREIGHT CARS.

Mr. Waitt from the special committee on "Home defects on freight cars—defects that may be passed to the owners by inspectors," submitted the following report:

"We would recommend for the consideration of the Club that the following defects on homebound cars, when they do not give evidence of recent origin, or of being caused by derailment or wreck, or by unusually rough handling, should be considered as home defects, and the cars should be passed home to the owners by inspectors, without a defect card:

1. Brake shoes worn out.
2. Journal bearings worn out.
3. Truck bolsters broken or cracked.
4. Truck transoms (wood) broken or cracked.
5. Body bolsters broken or cracked.
6. Spring planks broken or cracked.
7. Truck spring broken or cracked.
8. Roof boards loose or missing, or tin or iron roof loose.
9. End or side sheathing loose.
10. End or side bulge loose or missing.
11. Ends or sides bulged, not broken.
12. Corner plates cracked.
13. Draft springs broken.
14. Draft timber bolts broken.
15. Center plate bolts broken.
16. Bolster guide bars broken.
17. Bolster guide blocks broken.
18. Truck truss rods broken.
19. Body truss rods broken.
20. Pedestals cracked.
21. Oil box covers missing or broken.
22. Spread trucks.
23. Loose dead blocks.
24. Cars low on trucks where wheels come in contact with intermediate timbers.
25. Side bearings and bolts broken.
26. Arch bars broken or cracked.
27. Decayed timber.
28. Leaky roofs.

The Committee would say that we find that an arrangement similar to this is, and has been in force at several large inspection points for a number of months, and as yet we have heard of only the most satisfactory results coming from it. As the defects above mentioned are a class of old defects that are quite prevalent, and as a great many defect cards in a year have to be issued for these defects, the greater proportion of which are never used as authority for bills, your Committee believe that greater relief would be experienced at inspection points through a reduced number of defect cards applied, and that quite a considerable reduction in delays to cars on account of questions arising from defects of the classes mentioned. Your Committee believe further that with an understanding as above outlined, when a car belonging to a private company was found to have defects as mentioned, there could be no question as to the propriety and validity of a bill rendered against the owner of the private car, under Rule 10, whereas at the present time there is the prospect of having such bills questioned and invalidated.

The committee trust that the suggestions made will have a full and hearty discussion, and that the Club may be able to recommend to the M. C. E. Association some wise action that may benefit all the roads in the country in the matter of handling old defects on cars. A. M. Waitt, J. R. Petrie, W. H. Reynolds, Committee.

In connection with the foregoing, Mr. Waitt read a letter from R. C. Blackall, a member of the committee, in which he says:

"I have given the subject careful attention and have had the questions discussed by our inspectors. While there may be many defects that owners of cars should be responsible for, I think the present code of rules covers all the points necessary. Inspectors know that defects should either be repaired or the car carded. I would not approve the recommendation of the committee appointed by the M. C. E. Association on joint inspection for the reason that a few inspectors may have intelligence enough to be guided by them. They would, however, confuse a majority of them. Rule 10 fully covers the question so far as private cars are concerned. The question is a very important one, and should have careful consideration before changes are made."

President Chamberlain asked whether defects upon a railroad company's cars for which bills would be rendered in accordance with Rule 8, or old defect rule, would be treated the same as defects upon private companies' cars.

Mr. Higgins argued that brake shoes should be maintained under all circumstances, especially since the introduction of air brakes.

President Chamberlain argued that to avoid discussion and correspondence the report of the committee augmented Rule 8 and companies should be allowed to make bills.

Mr. Waitt said it was not intended the report should be construed as allowing companies to run their cars continuously with the defects noted. It gave authority for a road accepting a car to put it in their shop and make the necessary repairs. The report submitted was simply an outline, which, it was expected, the club would boil down and place in proper shape for presentation to the M. C. E. Association.

Mr. Mitchell asked whether if the Erie accepted a car from the Lake Shore loaded with grain for New York and reloaded with anthracite coal, and with fair usage it was returned with a bulged end, would the Lake Shore ask for a pass card.

Mr. Waitt said he would not, and did not think it would be fair to do so if it was due to weak or defective construction.

Mr. Butler could see no occasion for any change in the present rules.

The various inspectors were called up for an expression of opinion, and all agreed that the present rules were proving sufficient for exigencies. Mr. Donahy took occasion to say that he believed there were almost too many rules now, exclusive of the M. C. E. rules.

Mr. Waitt moved that the Club recommend for the consideration of the Arbitration Committee of the M. C. E. Association a supplement to rule 8, the same to embody such of the defects in the report submitted as are not now covered by that rule.

The list of defects was read and it was found that Nos. 1, 2, 3, 5, 6 and 7 were covered by rule 8. No. 14 was rejected. No. 19 was amended by adding "to be hung up in safe condition to run," and No. 25 by adding "in a manner that does not interfere with the safe handling of the car." The others were approved and the report as amended was then adopted.

The President announced that the subject for discussion at the next meeting would be "What practice should be adopted in order to collect bills for a portion of the defects noticed on M. C. E. defect card that render cars unsafe when card includes other defects which are not necessary to be reported." The committee appointed to prepare a report consists of S. Higgins of the Erie, Robert Potts of the Michigan Central, and P. E. Garrison of the West Shore.

Cornell Association of Civil Engineering.

At a meeting of the above association at Ithaca, N. Y., last week, the following were elected officers: President, Henry R. Lordly; Vice President, Dan B. Clark; Secretary, C. W. Ashby; Treasurer, John W. Ripley. The Alumni, Seniors and Juniors of the College of Civil Engineering of Cornell University constitute the membership roll, the officers being elected from the Senior class. The object of the association is to discuss papers prepared by members or selected from the different engineering journals, and, secondly, to provide a course of lectures by non-resident lecturers.

Northern Pacific Mechanical Club.

The second regular meeting of this club took place, Nov. 22 at Tacoma, Wash., in the offices of the Edison shops, President John Hickey in the chair. The association, besides the master mechanics, is composed of Northern Pacific general car foremen, road foremen of engines, general foremen of shops, with the Superintendent of Motive Power and Machinery and the Master Car Builder, J. C. Barber. About 28 members were in session. After the reading of papers on air brakes and other subjects, followed by general discussions, the Society adjourned to meet at 9:30 a. m., Nov. 23. A talk was given on "Locomotive Injectors," by George Royal, a representative of the Nathan Manufacturing Co. Following is a list of subjects introduced by papers:

- First—"Air brakes; removal of oil plugs in air brake cylinders; their necessity." W. Moir, of Sprague.
- Second—"Car decking; what is the best manner of forming the edges." J. C. Barber, of St. Paul.
- Third—"Protection against fire in Caboose; what defects in arranging lamps and stoves have you noticed?" J. C. Barber.
- Fourth—"Air brakes on boxcars; defects in arrangement of fixtures and air hose coupling." B. Haskell, of Missoula.
- Fifth—"Proper care and maintenance of air brakes; testing same at terminals together with improper leverage and how to avoid." D. H. Fairchild, of Rocky Mountain division.

The Society of Naval Architects and Marine Engineers.

It is announced that prominent and influential men in the shipbuilding and shipping interests of the United States have completed the preliminary organization of a professional society of high standing, to be called "The Society of Naval Architects and Marine Engineers," whose object shall be to promote the art of shipbuilding in all its branches. The committee of organization, consisting of William H. Webb, of New York; Lewis Nixon, General Manager of Cramp's works; Col. E. A. Stevens, of Hoboken; Francis T. Bowles, Naval Constructor, United States Navy, and Clement A. Griscom, President of the International Navigation Company, expect to incorporate the Society in New York, and are now sending out invitations to membership, hoping to have the first meeting at the time of the naval review next spring. The list of those who have accepted positions in the preliminary organization includes many well-known names from all sections of the country. The President is Clement A. Griscom; Vice Presidents—Theodore D. Wilson, Chief Constructor of the Navy; Charles H. Cramp, George W. Melville, George W. Quintard, New York; Irving M. Scott, San Francisco; Gen. Francis A. Walker, Boston, and W. H. Webb, New York. The members of the Council include H. T. Ganse, Wilmington, Del.; Gen. F. W. Wheeler, West Bay City, Mich.; W. H. Jacques, Bethlehem Iron Works; Gen. T. W. Hyle, Bath, Me.; J. W. Miller, New York; C. H. Orcutt, Newport News, Va.; Nathaniel G. Herreshoff, J. F. Parkhurst, Cleveland, O.; Naval Constructors Hitchborn and Bowles of the navy; Chas. H. Loring, Captain Sampson and Chadwick of the navy, and Narrington Putnam, of New York. W. L. Cappa is Secretary and Treasurer.

University of the City of New York.

A course of lectures by eminent practicing engineers has been arranged by the Department of Engineering of the University of the City of New York, on Washington Square, to be delivered during the winter, the dates to be settled upon later. The first of the series of addresses was by Mr. F. Collingwood, Secretary American Society of Civil Engineers, who spoke on Nov. 21, on the subject "Practical Points on the East River Bridge at New York." The names of the other lecturers and the subjects of the addresses are as follows: Walter F. Whittemore, Assoc. Am. Soc. C. E., subject "Docks"; Fred. H. McDowell, New York, Consulting Mine Engi-

near Lackawanna Iron & Steel Co., and Manager Union Wire Tramway Co., subject, "Wire Rope and Its Applications"; Major A. F. Sears, Mem. Am. Soc. C. E. Engineers, subject, "The Engineer as a Social Prophet"; Charles B. Brush, Vice-President American Society Civil Engineers and Director University Engineering School, subject, "Notes on Water Works."

The Western Railway Club

At the November meeting of this club the paper on "Car Heating by Steam" by Mr. Waitt, which was read at the September meeting was discussed and a paper on "Lubrication" was read by Mr. J. N. Barr. Mr. Barr's paper is reprinted in another column.

In discussing the paper on car heating, Mr. Waitt exhibited the valves which have been adopted for cars on the Vanderbilt line. The regulating valve is a disc valve with a vulcanized disc and a conical extension. Experiments with this valve have shown that in mild weather the graduation is all that can be asked for, and the trainmen with simply a few instructions can control the steam and keep the car comfortable without any great difficulty. The drip valve used is merely a plain asbestos disc valve.

Mr. Barr said that he was glad to see a tendency to simplicity in the matter of steam heating. He thought that there had been too much of an effort made to have everything automatic, and suggested that with proper attachments the old car stove could be made automatic, but that no one would regard that advisable and that the same argument could be applied to steam heating. We expect the brakeman to furnish enough steam by operating the admission valve, and we expect him to take care of the waste by operating the drip valve.

Mr. Rhodes thought that not enough attention had been given to the question of the cost of heating cars, and believed that if more careful figures could be worked out that many lines, particularly in the West, would find that the cost of heating cars (from the locomotive) with soft coal at \$1.25 to \$1.50 per ton would be very much less than with hard coal at a cost of \$5 per ton.

Mr. Halliday said that while Mr. Waitt had recommended the use of direct steam, if he were selling heating apparatus he would not recommend direct steam, as the roads which had almost their whole equipment fitted with Baker heaters wished to utilize them as far as possible. In reply Mr. Waitt says that with the exception of new cars built last year all of their equipment was originally fitted with Baker heaters, and that it was considered economy to remove the Baker piping, put in the larger piping on the side without any return bends under the seat, use direct steam and convert the Baker heater into a stove by putting a cast iron fire pot into it, so that the car could be warmed slightly in case of emergency.

Mr. Barr thought in regard to heating cars with steam and using auxiliary devices, such as stoves, that the history of heating would be much like the history of the old injector, in the same way as it was now considered unnecessary to put a pump on the left-hand side of an engine for emergencies. The use of stoves would be gradually dispensed with except possibly in isolated locations.

Mr. McKenzie agreed with Mr. Barr and said that when they heated cars by steam they removed the stove entirely and kept as an auxiliary a stove in the baggage car supposed to be ready to fire up at any minute.

PERSONAL.

—Mr. J. B. Mullett, formerly General Manager of the Detroit, Lansing & Northern, died at Detroit, Mich., last week.

—Ex-Governor Pingree, L. G. Bagley, of Rutland, and Armory Davison, of Craftsbury, Vt., have been appointed by the Governor of Vermont as Railroad Commissioners and confirmed by the Senate.

—Mr. W. I. Cook has been appointed Superintendent of Motive Power and Rolling Stock of the Toledo, St. Louis & Kansas City, with headquarters at Frankfort, Ind., vice John Orton, resigned.

—Mr. Berrien Blasker, assistant civil engineer of the Nashville, Chattanooga & St. Louis, who was accidentally burned at a fireworks celebration at Nashville, Tenn., died in that city on Nov. 28 from the effects of his injuries.

—Mr. Stewart Mackie, of New York, Vice-President and Secretary, and Mr. L. M. Johnson, General Manager of the Mexican International Railroad, are making a trip over the line from Monclova to Sierra Mojada, which is now being built.

—Mr. E. J. Foster, formerly Assistant General Freight Agent of the Chicago & Northwestern road, with headquarters at Winona, Minn., has accepted the general agency of the Equitable Insurance Co. His headquarters will be at Chicago.

—Mr. Hunter McDonald has been appointed Chief Engineer of the Nashville, Chattanooga & St. Louis Railroad to succeed the late Colonel R. C. Morris. Mr. McDonald has been connected with the company for a long time, and has recently been Engineer in charge of the Huntsville extension, from Huntsville to the Tennessee River.

—Mr. David Pottinger, General Superintendent of the Intercolonial Railroad, has been appointed General Manager of the Canadian Government railways, succeeding Mr. Collingwood Schreiber, who has been made Deputy Minister of Railways and Canals, vice Mr. Trudeau, retired. Mr. Pottinger's headquarters will remain at Moncton, Ont.

—Captain George C. Hamilton, formerly of New York State, died at his home in Franklin, Pa., Nov. 17. He was engineer in charge of the preliminary surveys and location of the proposed line to connect the Lake Shore & Michigan Southern and Beech Creek roads between Franklin and Clearfield and known as the New York, Philadelphia & Chicago.

—Mr. Cyrus Wellington has been appointed General Solicitor of the Great Northern with jurisdiction over the territory west of the Missouri River. Mr. Wellington is a resident of St. Paul, Minn., and has, for several years been one of the firm of Irwin & Wellington.

—Mr. G. J. Grammer, for several years Traffic Manager of the Evansville & Terre Haute Road, has been elected President of that company, to take the place of Mr. D. J. Mackey, resigned. Mr. Grammer was appointed General Freight and Passenger Agent of this road in 1881 and Traffic Manager in 1886. He was previously Manager of an Ohio River steamboat line.

—Mr. Henry A. Milholland has been appointed an Assistant in the Philadelphia & Reading motive power

department at Reading, Pa. Mr. Milholland was for a number of years in the employ of the Pennsylvania Railroad at Altoona, and was latterly mechanical engineer of the Gould Car Coupler Co., Buffalo. He is the son of the late James Milholland, years ago a well-known mechanical officer of the Philadelphia & Reading.

—Mr. W. A. Eckersley, General Manager for the contractors of the Mexican Southern, Messrs. Reed & Campbell, has left Mexico for England, having completed the line to Oaxaca. Mr. Eckersley's future movements are at present uncertain, but it is expected that he will return to Mexico should the proposed extension of this line to Tehuantepec be finally decided upon. Construction to Oaxaca having been completed, Mr. Walter Morcom, General Manager, has taken charge of the line from Puebla to Oaxaca.

—Hon. Aldace F. Walker has accepted the position to which he has been chosen by the Presidents of the Trunk Line and Central Traffic Association railroads. His title is to be Chairman of the Joint Committee, and he will have his office in Chicago. The Joint Committee, which is composed of the presidents and chief executive officers of the lines in both associations, has heretofore had no separate chairman, its orders having been promulgated jointly by Chairmen Goddard and Blanchard. These latter will now be Commissioners of their respective associations and Vice Chairmen of the Joint Committee.

—Mr. F. W. Johnstone, Superintendent of Motive Power of the Mexican Central Railway, is making a tour of the United States, visiting the various shops where he has work in progress. Among other shops, he will visit the Rhode Island Locomotive Works to inspect the new and very interesting bogie locomotives designed by him, and illustrated in the Railroad Gazette March 25, 1892. One of these locomotives will be completed within a few days, and as it is the first engine of the kind ever built and contains some new and radical features, the result of its workings will be of unusual interest. The engines are compound, and the cylinders are attached rigidly to the boilers and frames, while the driving wheels swivel in an independent frame. The connections between the driving wheels and crossheads are made by means of connecting rods having practically universal joints.

—Announcement was made this week of the resignation of Mr. Benjamin Norton, Vice-President and General Manager of the Long Island. He has been succeeded by Mr. Everett R. Reynolds as General Manager. Mr. Norton's service with the Long Island road began in 1881, when he was appointed Purchasing Agent. During the year previous he had served as Ticket Agent and Money Collector on the Manhattan Beach road and as Clerk on a Western road in which Mr. Corbin was interested. In 1886 Mr. Norton was appointed Assistant Superintendent, Traffic Manager in 1887 and Vice-President in 1888. Mr. Reynolds, his successor as General Manager of the Long Island, began his service on the Long Island as an office boy. For some time he was Private Secretary to Mr. Corbin and has had the title of Assistant to the President on the Coney Island since 1890, and on the Philadelphia & Reading and the New York & New England, and Acting General Manager of the latter, when Mr. Corbin was President of those roads. In 1884 Mr. Reynolds was made Secretary of the Florida Railway & Navigation Co., returning to the Long Island in 1886. He is 28 years old, having been born in New York City in 1864.

—Mr. H. W. Reed, just elected President of the Roadmasters' Association of America, was born in Neenah, on Lake Winnebago, Wis., in 1856. His father, one of the early pioneers of Wisconsin, moved to Florida at the close of the war and was elected Governor of the State in 1868, and re-elected in 1870. H. W. Reed attended school and graduated at "Little Blue," Farmington, Maine, and from there entered college at Syracuse University, New York. He studied engineering himself, and was engineer of the Agricultural College Exposition, of Florida, in 1877. He was made Assistant Engineer and Superintendent of Construction of the Peninsula Railroad of Florida, 1878-1879, and became Assistant Engineer and then Master of Roadway of the Savannah, Florida & Western Railway, in 1880, which position he has filled to the present time. He is a member of the American Society of Civil Engineers and of the Engineering Association of the South, and President of City School Board, and Consulting Engineer of City Water Works of Waycross. He has been a member of the Roadmasters' Association of America since its second meeting, and was for three years its Secretary and Treasurer.

ELECTIONS AND APPOINTMENTS.

Alliance & Northern.—A circular issued by this company and the Lake Erie, Alliance & Southern announces the promotion of Superintendent E. E. Seranton to the position of General Manager. W. D. Winans, Assistant General Passenger Agent, has been promoted to the position of General Freight and Passenger Agent.

Brookfield & Northern.—At a meeting last week, at Brookfield, Mo., of the stockholders of this projected road, the following directors were elected: L. S. Bowden, John Ford, G. W. Martin, H. N. Armstrong and H. M. Dake, of Brookfield, Mo.; G. B. Burton and Dr. W. W. Shearer, of Greencastle, Mo.; J. W. Moffatt, of Winegar, and Ambrose Wood, of Mendon; W. J. Cox, G. D. Griffith and E. E. Estell, of De Witt, Mo., and N. H. Fairchild, of Chicago. L. S. Bowden was re-elected to the presidency; W. J. Cox, of De Witt, W. W. Shearer, of Greencastle, Vice-Presidents; Walter Brownlee, Secretary; John Ford, Treasurer; W. J. Cox, of De Witt, General Manager; H. N. Armstrong, Chief Engineer, and N. H. Fairchild, of Chicago, Solicitor.

California & Northeastern.—The names and addresses of the incorporators of this company, already noticed, are: Joseph E. Barry, Solomon Bloom and Edward B. Young, San Francisco, Cal.; Marcus D. Hyde, Oakland; James Spiers, Berkeley, Cal., and W. H. Smith, Salt Lake, Utah.

Central New York & Western.—S. Blair formerly Receiver of the Lackawanna & Southwestern, which has been succeeded by this company, has been appointed General Superintendent with headquarters in Hornellsville, N. Y.

Charleston & Savannah.—The annual meeting of the stockholders was held at Charleston, S. C., Nov. 20. All the present officers of the road were re-elected, including H. B. Plant, President, and H. S. Haines, Vice-President.

Cleveland, Cincinnati, Chicago & St. Louis.—Master Mechanic J. H. Berry, of the Cincinnati Division, has had his jurisdiction extended over the Sandusky divisions, with headquarters remaining at Delaware, O.

The headquarters of the Assistant General Freight Agent in charge of the Michigan Division have been removed from Elkhart, Ind., to Anderson, Ind. All communications intended for Homer F. Frost, Assistant General Freight Agent, should be addressed to him at Anderson, Ind.

Illinois Central.—J. B. Kemp has been appointed Superintendent of Terminals for this company at Memphis, Tenn.

Long Island.—Everett R. Reynolds has been appointed General Manager, with headquarters at Long Island City, N. Y., vice Benjamin Norton, resigned. The appointment took effect Nov. 15.

Meriden, Waterbury & Connecticut River.—The following directors were elected at Meriden, Conn., Nov. 23: F. H. Prince, of Boston; Charles Parsons, Jr., of New D. S. Plume, E. D. Steele and R. S. Chase, of Waterbury; Samuel Dodd, George Rockwell, W. H. Lyon and C. B. Rogers, of Meriden, Conn.

Middle Georgia & Atlantic.—The following is a list of the officers of the company: President, Joseph D. Weed Savannah, Ga.; Secretary, David Robinson, Savannah, Ga.; Treasurer, I. G. Haas, Savannah, Ga.; General Manager, W. B. Thomas, Atlanta, Ga., and Superintendent, J. A. Droge, Eatonton, Ga.

Mobile & Montgomery.—At the stockholders' annual meeting at Montgomery the following officers were elected: G. W. Craik, President; A. C. Danner, Vice-President; J. H. Ellis, Secretary. Directors: M. C. Burke, G. W. Craik, A. C. Danner, J. M. Falker, J. I. McKinner, C. Quarrier, M. H. Smith, J. B. Thompson and Theo. Welch.

New York, Lake Erie & Western.—The annual meeting of the stockholders was held in New York, Nov. 29. E. O. Mills presided. President John King voted on \$22,715,200 of stock and \$6,175,200 of bonds held abroad; and Mr. John G. McCullough, representing the Mills-McCullough Committee, voted on \$3,738,300 of stock and \$25,308,700 of bonds. Following are the names of Directors elected: John King, John G. McCullough, Ogden Mills, J. Lowber Welsh, Abram S. Hewitt, William Whitewright, William A. Wheelock, Alexander E. Orr, Henry H. Cook, Morris K. Jesup, George W. Quintard, William Libbes, Cortlandt Parker, James J. Goodwin, William L. Strong, William N. Gilchrist and B. B. Thomas. The new Directors are the Messrs. Hewitt and Orr, who succeed M. F. Reynolds and Josiah Belden, deceased. The following officers were re-elected: John King, President; J. G. McCullough, Chairman of the Executive Committee; E. B. Thomas, First Vice-President.

Philadelphia & Reading.—David J. Dampman has been appointed chief train dispatcher of the main line division, with headquarters in Reading, Pa.

Richmond & Petersburg.—The Board of Directors has re-elected all the old officers of the road with the exception of M. W. Yarrington as treasurer, he having resigned. W. R. Jones was elected to fill the vacancy.

Savannah, Americus & Montgomery.—C. B. Wilburn, the General Freight Agent of the Georgia Southern & Florida, has been appointed General Freight Agent of this road, vice E. S. Goodman, resigned.

Savannah, Florida & Western.—The annual meeting was held at Savannah, Ga., Nov. 29. The old board was re-elected, as follows: President, H. B. Plant; Vice-President and General Manager, H. S. Haines; General Auditor, D. F. Jack; Secretary, R. B. Smith; Treasurer, J. M. Lee; Directors, H. B. Plant, H. S. Haines, Henry Sanford, B. F. Newcomer, J. H. Estell, H. M. Flagler and M. K. Jesup.

Southern Express Co.—The company had its annual meeting at Savannah and re-elected the old officers, as follows: President, H. B. Plant; Vice-President and General Manager, M. G. O'Brien; Vice-President, M. F. Plant; Secretary and Treasurer, G. H. Tilly; General Auditor, C. L. Loop.

South & North Alabama.—The annual meeting of the stockholders was held at Montgomery, Ala., Nov. 26. The following officers were elected: H. F. DeBardelaben, President; M. H. Smith, Vice-President; G. W. Craik, Secretary and Treasurer; W. M. Newbold, Superintendent. Directors: B. J. Baldwin, F. M. Billings, W. L. Chambers, H. F. DeBardelaben, John W. Durr, L. M. Falk, Bolling Hall, E. B. Joseph, M. P. LeGrand, John T. Milner, John C. Orr, A. M. Quarrier, M. H. Smith.

Toledo, St. Louis & Kansas City.—W. I. Cook has been appointed Superintendent of Machinery and Rolling Stock on the road, vice John Orton, resigned.

Western New York & Pennsylvania.—C. C. Keenai, formerly of the Pittsburgh Locomotive Works, has been appointed general foreman of the shops at Olean, N. Y.

Wilmington & Weldon.—At the annual meeting at Wilmington, N. C., Nov. 23, the following Board of Directors was elected: W. T. Walters, B. F. Newcomer, Michael Jenkins and J. P. McCoy, Baltimore; H. B. Plant, New York, and H. Walters, George Howard, E. B. Borden, W. H. Willard and A. J. Derocet, of North Carolina. Warren G. Elliott was re-elected President; H. Walters, Vice-President; John R. Kenly, General Manager; John F. Divine, General Superintendent.

Yazoo & Mississippi Valley.—J. B. Kemp has been appointed Superintendent of Terminals at Memphis, Tenn. He will have direct charge of all transportation department matters within the Memphis terminal district, for this road and the Illinois Central.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Bedford Belt.—The company has completed and has in operation 11 miles of its road near Bedford, Ind. The line has been built chiefly to reach the limestone quarries in the vicinity of Bedford and secure rail connection for that traffic with the Evansville & Richmond, the Louisville, New Albany & Chicago and the Ohio & Mississippi. The surveys have been completed for a line from Bedford to Tanyard Branch on the Ohio & Mississippi, three miles, and the contracts for building this line will probably be let within 30 days. The 11 miles of road now in operation reaches Bedford, Buff Ridge and Dark Hollow, and the location practically gives the company two main lines. A. N. Nichols & Co., Commerce Building, Louisville, Ky., were the contractors. There was considerable heavy rock work, an iron bridge of 100 ft. span and several high trestles. The maximum grades are 18 $\frac{1}{2}$ ft. to the mile, and the maximum curves, 10 deg. The equipment includes three Baldwin 52-ton six-wheel connected locomotives; three cabooses; two passenger cars bought but not delivered,

and 1,000 platform cars of 60,000 tons capacity being built. The President is W. L. Breyfogle, 34 Kenyon Building, Louisville, Ky.; T. J. McGuire, of Bedford, Ind., is General Manager, and James K. Zollinger, of Louisville, is Chief Engineer. The Chicago office is at 243 Rialto Building.

Beech Creek.—The extension of this road which begins at the village of Keermoor and extends west to Mehaflly by way of the Susquehanna River and Bell's Landing is now about completed as recently reported. There are two large tunnels on the new road, both double track, section 28 x 36, one 950 ft. long and the other 500 ft. long. The arching and masonry in the latter tunnel is not yet completed, but the line will be ready for traffic by Jan. 1. This is about the only work which the contractors have to finish. The track has been laid and ballasted on the 12 miles and the connection made with the Cambria & Clearfield branch of the Pennsylvania. The two companies are to use the line between Mehaflly and Patton in Cambria County, about 26 miles, as a joint line. The extension has been built to bring out coal mined on the lands of the Chest Creek Land and Improvement Company which owns 11,000 acres of coal land. George S. Good & Co., are the contractors for the extension from Keermoor and also built the four miles on the Cambria & Clearfield between Lajose and Mehaflly which was constructed to complete the line between Patton and Keermoor.

Birmingham, Laney & Piedmont.—The extension of this line is proposed from near Laney, Ala., to the Burke Iron Mountain. The line will be about eight miles long and it is probable that it will be built early in January. About seven miles of the road is now in operation and it has been surveyed between Laney and Piedmont, Ala., about 23 miles. P. S. Fitzgerald, of Gadsden, Ala., is chief engineer.

Bonne Ste. Anne.—H. J. Beemer, of Montreal, contractor, is pushing the construction of the Bonne Ste. Anne road to Murray Bay, Que., on the St. Lawrence River. Construction trains are now running over 10 miles of the road.

Brainerd & Northern Minnesota.—This line has now been completed for about 40 miles north of Brainerd, Minn., on the Mississippi River, to Gardner, and no further work will be done this year. The line will probably not be opened for general traffic for some time. During the winter the company will be engaged in hauling logs to Brainerd where a saw mill has been built by the Northern Milling Co., of Minneapolis, which owns the new road. It is proposed to extend the line next year to Park Rapids, Minn., on the Great Northern and also toward Leech Lake. R. W. Jones, of Minneapolis, is General Manager.

British Columbia Roads.—Application for a charter will be made at the approaching session of the legislature for the purpose of constructing a line commencing at Lardeau City, thence through Lardeau Pass, to a point on the northwest shore of lake Kootenai, with a branch in a northerly direction along the course of the Incompleux River or Fish Creek, to near the headquarters of the stream.

Brookfield & Northern.—H. N. Armstrong, of Brookfield, Mo., the Chief Engineer, reports that the surveys are still in the field north of Brookfield, Mo. During the winter surveys will be made for the proposed bridges over the Missouri River and also across Grant River. Some of the contracts may be let next spring.

Chicago, Rock Island & Pacific.—The track south of the Red River reached the town of Harrisonia, Tex., at the crossing of the Missouri, Kansas & Texas east of Henrietta, last week. The distance between the Red River and Bowie, Tex., which will be the end of track, this winter at least, is 24 miles, and there is about 15 miles of track still to be built. The daily newspapers print reports that the surveyors have located the line south of Bowie to Springtown and that the contracts have been let for grading this section but the report is not confirmed.

Clear Lake & Russian River.—One of the officers of this company which has been recently organized at Lakeport, Cal., writes that it has not yet been decided whether to build a road to be operated by steam locomotives or by electric motive power. If an electric line is decided upon it would be about 20 miles in length with four per cent. grades, and a steam road would be between 30 and 40 miles long. The route is from Lakeport on Clear Lake southwest to a point on the San Francisco & North Pacific south of Ukiah at a point near Hopland. The directors expect to secure subsidies from Lakeport and along the proposed line. F. W. Gibson, of Lakeport, Cal., is President, and W. J. Biggerstaff is Secretary.

Columbia & Puget Sound.—Track on the Maple Valley extension has been laid for 7½ miles to the first bridge. There are two trestle bridges on the remaining two and a quarter miles of the road, one 300 ft. long and 76 ft. high, and the other 180 ft. long and 50 ft. high, and will delay the track a few days, but the work will be finished this or next week to Maple Valley, Wash.

Danbury & State Line.—Articles of association have been filed with the State Secretary at Hartford, Conn. The road is to extend from Danbury to the New York State line at Ridgefield. The capital stock is \$550,000. The directors are residents of Danbury, except the following residents of New York City: John Whalen, Edward Smith and Henry Blake. The plan of the company is said to be to unite the New York & New England road with the New York & Harlem by building a line 14 miles long from Danbury to Katonah, N. Y. Six miles of this line would be in Connecticut.

Duluth & Iron Range.—The extension to the Mesaba Iron Range has been completed, and last week the Minnesota Railroad Commission made a trip over the line for the purpose of inspecting the property. The extension is from Allen Junction, Minn., on the main line to the West Canton mine, 15 miles. The construction of 12 miles of new road, on two lines, will soon be undertaken. The lines are from Merritt Junction to McKinley, 3.6 miles, and from McKinley to Sec. 4-53-17, 8.6 miles. Winston Bros., of Minneapolis, are the contractors.

Duluth, Mesaba & Northern.—Work is nearly completed on the branch to the Blwabik mine in the Mesaba iron range in northern Minnesota. The cutting in this line is very heavy and there is an unusual amount of bridge work, which has delayed the track-layers. The main line has been in operation for some weeks.

Duluth, South Shore & Atlantic.—The extension from Iron River Junction to West Superior, Wis., is nearly

completed. The arrival of the first train in that city will be celebrated by the citizens, who will have for their guests over 100 business men from Northern Wisconsin and the Michigan Peninsula. This demonstration is to take place on Dec. 2, and after that date the road will be open for business.

Fairmont, Morgantown & Pittsburgh.—The contractors all along the line, from Morgantown, W. Va., to Smithfield, Pa., are being urged forward as rapidly as possible by the Baltimore & Ohio. P. H. Bennett, who has 5½ miles, from Point Marion, Pa., south, has his contract practically completed, there remaining only a small amount of ballasting to be done. The Lane Bros.' contract is finished, so far as grading is concerned, but most of the ballasting remains to be done. The Cheat River bridge abutments are up beyond the reach of any high water and the work is being rapidly pushed. Beyond the Cheat River, Bennett & Talbot have done very little, but will probably be through before the Cheat River bridge is finished, about March 15.

Fall Brook.—A survey has been made from Mills southwest to Ulysses, Potter County, Pa., a distance of seven miles, and the branch will be built early in the spring. It is an extension of the Cowanesque branch of the Fall Brook Railway Co., formerly the Corning, Cowanesque & Antrim Road.

Fremont, Cripple Creek & State Line.—This company has now secured a right of way over the entire proposed line of 40 miles, and has graded for a mile out of Florence, Col. The company is now negotiating for money to complete the line. No bids have yet been asked for. This company was organized early in the year, and reorganized last month. The officers are: W. E. Johnson, President; James A. McCanlass, General Manager; James Collins, Secretary and Treasurer, all of Florence, Col. The line extends northward from Florence, along Six Mile Creek for a distance of eight miles, which will be light work to grade, and it then enters Ute Creek Cañon, following that for a distance of 20 miles. Thence by way of Lawrence and Requa into Fremont. The maximum grade is four per cent. There will be 20 miles of heavy rock work and 12 more of medium difficulty. The route passes the great alabaster beds, with veins 70 ft. in thickness, and also a number of new mining camps.

Gladeville.—The plans made for the building of this road this year have been abandoned, but it is proposed to award the contract for the construction of the road from Wise Court House north to Gladeville, Va., near Big Stone Gap, about 10 miles, next spring and to complete the road at once. E. M. Fulton, of Wise Court House, Va., is President.

Great Northern.—The officers expect that the track on the Pacific Coast extension will be completed this week. E. H. Becker, Chief Engineer of the extension, and J. F. Stevens, Principal Assistant Engineer, arrived in Seattle about Nov. 15, and the local papers print the following interview with Mr. Becker, which will probably be the last report of the kind to be made:

He said that on one day of the week two miles of track were laid on the east side and half a mile on the west side of the mountains, leaving about 35 miles of track to be laid. Most of this will be put down from the east end after the rails now on the west side are used. We expect tracklaying to be completed the first week in December. The temporary bridges are all in, and the spans will be completed by the middle of December, with the exception, perhaps, of Martin Creek. The grading has been finished on the switchback and the bridges all built. There is a foot of snow on the summit, but last winter we laid track on 3 ft. of snow, half of which proved to be ice, so we shall not stop for 1 ft. of light snow in the timber. We shall shovel it off with scrapers.

Harriman & Port Royal.—We are informed that a survey for this line has been completed excepting about 15 miles, and that 30 miles of the road is now graded. The route is given as from Harriman, Tenn., via Kingston, Tenn., Franklin, N. C., Walhalla, S. C., to Anderson, S. C., 220 miles. There will be three tunnels on this route 5,800 ft., 500, and 300 ft. long. The officers of the road are Alfred E. P. Rockwell, President; James McDowell, Vice President; Daniel Denney, Secretary; J. D. Roberts, Treasurer and R. H. Fitzhugh, Manager, all of Harriman, Tenn.

Iron Range & Huron Bay.—This company was organized to build a railroad from Huron Bay, on Lake Superior, south to Champion, Mich., a mining town some 30 miles west of Marquette. The grading was begun early in the spring of 1890 and completed in November, the track being laid to Champion, 34 miles from Huron Bay, and connected with tracks in the yard of the Champion Mining Co. at Champion, connecting with the Chicago & Northwestern, Milwaukee & Northern and the Duluth, South Shore & Atlantic railroads. There is a heavy rock cut at the Summit, which is 12 miles from the Bay, where solid rock was encountered, through which the cut was in the deepest place 62 ft. for a distance of about 1,000 ft. The grades are quite heavy from the Bay to the Summit, some being 4½ per cent., but all in favor of the loads, the road being built specially for carrying iron ore. The rails weigh 89 lbs. to the yard. The company is just completing a new ore dock, with all modern improvements, and will be ready for business at the opening of navigation. It is now making a survey for an extension of about 20 miles to Ishpeming and Negaunee, where large mines are situated. Sanford Keeler, of Arvon, Mich., is General Superintendent, and E. D. Miller, of Arvon, is Chief Engineer.

Kanawha & Buckhannon River.—On last Thursday Secretary of State W. A. Ohley, of West Virginia, issued a charter to this company to build a road from Lane's Station, W. Va., on the West Virginia & Pittsburgh, to Cleveland, Webster County, W. Va., by way of the Buckhannon River Valley. The capital subscribed is \$200,000 and is held by R. E. McQuay, of Buckhannon, W. Va., and others. The principal office of the Company will be in Baltimore, Md.

Ketner, Elbon & Shawmut.—B. E. Cartwright has recently begun the survey for this road in Elk County, Pa. The line is practically a continuation of the Glen Hazel & Shawmut road which was built last year by S. S. Bullis; of Olean, N. Y., and W. S. Weed & Co., of Binghamton, N. Y. The two lines when completed will extend from Ketner station on the Bradford branch of the New York, Lake Erie & Western south via St. Mary's to a point near Brockport on the Toby branch of the New York, Lake Erie & Western, a distance of about 30 miles.

Kingston, Nanpess & Western.—The grading and masonry is now well under way on the branch from Harrowsmith, the northern terminus, to Sydenham,

Ont., about five miles. The company is building the line with its own forces. The Thousand Islands Railroad, which is a leased line of this company, proposes to build a southern extension, less than a mile in length, across the mouth of the Gananoque River, where a 120-ft. swing bridge will be built.

Kishacoquillas Valley.—This road now under construction, is being pushed rapidly toward completion. Rails and equipment have been purchased and are beginning to arrive. McGovern Bros. have a sub-contract for four miles of this road from E. A. Tenny, the contractor. It is expected to have the grading completed by Jan. 1, and trains running by Feb. 1. F. F. Whittekin, of Tionesta, Pa., is chief engineer.

Lake Shore & Michigan Southern.—Trains have begun running over the new cut-off branch between Dunkirk and Silver Creek, N. Y., recently completed and built under the name of the Silver Creek & Dunkirk, the company abandoning the former main line tracks. As a result of the change it is understood the New York, Chicago & St. Louis has leased the abandoned double track of the Lake Shore between Silver Creek and Dunkirk, about nine miles, and will run all of its trains over it, the Western New York & Pennsylvania using the latter roads between Dunkirk and Silver Creek as a double track.

La Porte, Houston & Northern.—Work has been commenced on the last bridge on the line between Trinity Bay and Harrisburg, Tex., which is to be erected near the latter town. As soon as this is completed the road will probably be ready for operation, and will run trains into Houston about 20 miles from Trinity Bay over the track of the Houston Belt & Magnolia Park line. An agreement has been made with the North Galveston, Houston & Kansas City for the building of a joint line connecting the two roads. A survey is now being made from La Porte to Clear Creek, which portion of the line this company has agreed to build.

Linville Improvement Co.—A new survey is now being made from Linville south to Morgantown, N. C., on the Richmond & Danville for the road to be built by the Linville Improvement Co. Thomas F. Parker is President and S. T. Kealey is General Manager of this company, both of Linville, N. C. A survey has previously been made from Linville north to Cranberry in East Tennessee. Both lines are through a mountainous district.

Middle Georgia & Atlantic.—This road when completed is to extend from Eatonton, on the Central of Georgia, northwest through Machen to Covington, on the Georgia road, a distance of 44 miles. The road has been graded between these towns, and the first 20 miles between Eatonton and Machen is in operation and has been for two years. The syndicate recently formed to complete the road, which has been referred to in these columns, has agreed to have trains running to Covington in three or four months. The amount raised is \$150,000, and it was subscribed through a syndicate of stockholders in Savannah, New York and Philadelphia and they secured control of the assets of the Seaboard Company organized to build the road. Surveys were made by the construction company last year between Savannah and Eatonton and part of the line located and the construction of this line may be commenced when the work referred to above has been completed. W. B. Thomas, of Atlanta, is the General Manager of the road and David Robinson, of Savannah, Secretary.

Midland Terminal.—It is reported that this company has secured control of the line which was being built by the Colorado Midland to reach the Cripple Creek mines in Colorado. That company let the contract some months ago for a standard gauge branch from a point on its line called Hayden-Divide north to the town of Midland, Col., about 10 miles. The above company began the building of a narrow gauge road from the town of Midland to the Cripple Creek mines, and now that it has purchased the Colorado Midland branch it is reported that the entire line between the mines and the connection with the Colorado Midland will be built as a narrow gauge. A large part of the grading is now completed.

Minneapolis, St. Paul & Sault Ste. Marie.—The tracklaying on the northwestern extension from Valley City, N. D., has been suspended for the winter. The track has been laid for 80 miles northwest of Valley City to a point called Cathay, N. D. The distance from that point to the international boundary line, where the road is to connect with a branch of the Canadian Pacific now being built from near Regina, Man., is 180 miles. The grading has been completed for a distance of 28 miles beyond Cathay, but the unfavorable weather has compelled the suspension of the work and the track will not be laid on this section until spring. Linton & Co., of Minneapolis, are the contractors.

Minnesota & Wisconsin.—The route of this road, which has already been referred to, is from Emerald on the Wisconsin Central lines via Woodville on the C. St. P. M. & O., via Wildwood, in St. Croix County, to the town of Spring Valley in Pierce County, Wis., a distance of 27 miles. Sixteen miles of track is laid and the grading on the balance of the road will be completed by Dec. 16, and the track laid and cars running thereon by Jan. 1, thus making 27 miles of track laid during the year 1892. The road is located through a timber country, heavy clay soil, heavy work and cuts, maximum grade 40 ft. to the mile, curves three to four degrees. H. C. Truesdale, Minneapolis, is General Manager, and E. F. Dodge, Stillwater, Minn., Traffic Manager.

Missouri, Kansas & Texas.—The grading on the branch into Houston has been graded for over 50 miles east of Boggy Tank or to a point within 20 miles of Houston. The grading is in progress on all the sections into Houston, and the contractors have begun the erection of the three bridges over White Oak Bayou near Houston. The false work for the bridge over the Brazos River near Sealy will probably be finished this week, and this will enable the contractors to push the work more rapidly than heretofore, and the track will probably be laid before Jan. 1 on the road now graded.

Montreal & Western.—The ballasting and other work is now practically completed as far as the track has been laid and the road is in good condition for general traffic. A train is running daily between Montreal and Ste. Agathe, Que., via Ste. Therese and St. Jerome. A train runs three times a week between Ste. Agathe and St. Faustine, Que., and the work will shortly be completed as far as St. Jovite, Que., 62 miles from St. Jerome. This road is operated by the Canadian Pacific and H. J. Beemer is the contractor.

New Iberia & Vermilion.—Only two or three miles of track remained to be laid on this road at the last report, and it was then expected that the first train would be run over the line this week between Iberia, on the

Southern Pacific and Abbeville, La., a distance of 11 miles.

New Roads.—James King, M. P. for Megantic, will shortly commence work on the proposed road from Lyster station, on the Grand Trunk, north to St. Jean Deschailons, Que., in Lotbiniere County on the south shore of the St. Lawrence River, a distance of 20 miles. Mr. King expects to have 10 miles of the road built this season, and Dr. Rinfret, M. P. for Lotbiniere, will ask Parliament for a subsidy to complete the road.

North Galveston, Houston & Kansas City.—More than half of the track on the line between North Galveston and Virginia Point, Tex., has been built, and J. H. Barrett, of Houston, who has the contract for building the road, states that it will be completed by Dec. 15. The line now under construction is about 19 miles long, and is to be extended at once from North Galveston to the north bank of Clear Creek, to connect with an extension of the La Porte, Houston & Northern.

Nova Scotia Roads.—Application is to be made to the Provincial Legislature during the coming session for an act of incorporation to build a narrow gauge road from Yarmouth to Lockeport via Argyle, Barrington and Shelbourne.

Ohio Southern.—McArthur Bros., of the Temple Building, Chicago, who have the contract for building the Lima extension of this road, are prepared to let the sub-contract immediately for 60 miles of the line north-west of Springfield, O. The contractors are to construct 20 miles of this line immediately. The maximum grade will be 26 ft. to the mile and the maximum curvature two degrees.

Pennsylvania.—Trains began last week to use the southbound track on the elevated roadbed of the company in Baltimore from Biddle street to Orangeville. The northbound track is not yet completed. The new roadbed is elevated 7½ ft. above the old tracks, which will also be brought up to the same elevation.

The improvements about completed at Baltimore have cost, it is said, \$1,000,000. Iron bridges have been built over the grade crossings of 10 streets, and the line now enters Baltimore from Philadelphia on an elevated road over two miles in length. This new elevated line is double-tracked with 85-lb. rails, and double tracks also lead from the outskirts of the city to Sparrows Point and the Canton Terminals. The freight yard facilities at the Union Station have been largely increased. The new electric ventilating apparatus in the tunnels will be tested this week. The power-house at the end of the tunnel has been built, and the stack is 100 ft. high. This apparatus has been already described. Between Baltimore and Washington, on the Baltimore & Potomac, the road from below Calverton has been entirely straightened out and all curves removed. Above Baltimore, on the Philadelphia, Wilmington & Baltimore, between Principio and Charleston, seven curves have been reduced to two. As soon as Congress and the local authorities grant permission the company proposes to begin a system of improvements in and about Washington which will cost in the neighborhood of \$2,000,000 before they are completed. The improvements contemplated are extensive additions to the tracks in the outskirts of the city and the removal of every grade crossing leading to the station at Pennsylvania avenue and Sixth street. The grade crossings number nearly 20 on the line through the city of Washington.

Philadelphia & Reading.—A line is being surveyed from Kalmia, near Tower City, to near Williamsstown where connection will be made with the Williams Valley road. The object is to open a large timber tract in Clark's Valley. The new line will deliver timber to the Brookside collieries direct without carrying the freight around by Pinegrove as is done now.

Port Arthur, Duluth & Western.—From present appearances this road will be completed to the International line in the course of a couple of weeks. The local traffic between Port Arthur and the present terminus is already sufficient to pay operating expenses.

Quebec, Montmorency & Charlevoix.—H. J. Beecher, of Montreal, the contractor, is pushing the extension of the road east of St. Anne, Que., and the grading has been completed to near Cape Tourmente on the St. Lawrence River.

Rosedale & Mississippi Valley.—Charles Scott, of Rosedale, Miss., has about completed arrangements for building the road from Rosedale to Bogue Phalia, a distance of about 6½ miles. That is the objective point for the present. Next year it will probably be extended east as far as the Sunflower River. The road is being located, and cross ties are being taken out. Work has actually commenced and the road will be built to the Bogue by March 1.

St. Paul, Galesburg & Southern.—This company filed articles of incorporation in Illinois this week. It is proposed to construct a road from a point on the northern line of the state, in Jo Daviess County, through Jo Daviess, Carroll, Whiteside, Henry, Knox, Fulton, Macon and Cass Counties, to Waverly, Morgan County, with branches to Peoria and to a point on the Mississippi River. The capital stock is \$6,000,000. The incorporators are John A. Gray and A. C. Atherton, Lewistown, Ill.; William M. Van Nortwick, Batavia; Edward A. Temple, Des Moines, Ia.; T. M. Stuart, S. H. Mallory and D. J. Thayer, Chariton, Ia. Most of the incorporators are directors of the Fulton County Narrow Gauge road, and S. H. Mallory is President and A. C. Atherton is General Superintendent of that road.

Sandusky & Columbus Short Line.—The track has been laid on the entire road from Sandusky south to Columbus, O., a distance of 110 miles, and a good part of the ballasting is already completed. Three steam shovels are now being used on the finishing work. The station buildings have been nearly all erected. The company expects to open the entire line for general traffic about Jan. 10, and it will be operated in connection with the Columbus, Shawnee & Hocking road. F. J. Picard, General Manager of that road is General Manager of the new line and F. J. Aid of Columbus, O., is Chief Engineer.

Sinemahoning Valley.—The extension of this line through Potter County to Galeton, Pa., is making good progress and it is thought that the new line will be in operation early next spring. The extension is being built by Frank H. Goodyear of Buffalo who controls this road, but the work is done under a separate charter. The new road begins at Costello and extends east to Galeton, Pa., on the Addison & Pennsylvania, about 25 miles.

Sioux Falls, Yankton & Western.—Work was begun south of Sioux Falls, S. D., last week, and the contract-

ors have now about 300 men on the grading. James Campbell has the contract in Lincoln County between Sioux Falls and Lennox; Robert Huston from Lennox south; J. D. McDonald in Turner County, eight miles north of Centreville, and M. O'Neill between Volin and Yankton. The route of the new road being about seven miles southwest of Sioux Falls at the terminus of the Sioux Falls Terminal road, and it extends through Lennox and Volin, and then parallel to the Chicago & Northwestern to Yankton.

Staten Island Rapid Transit.—This company proposes to build a branch extension of the road from Arrochar, S. I., south to the Seashore resort at South Beach, a distance of 1¼ miles, and has asked for bids. The cost of construction will be about \$125,000.

Sugar Run.—This line, which has been under construction during the year through McKean County, Pa., has now been completed to a point 18 miles west of Bradford, Pa. Twelve miles of the line has been built this year from Palmers to Nelsons, the work having been done by the company's forces, under the supervision of C. V. Merrick, Superintendent. The road was built for S. S. Bullis, of Olean, N. Y., who is the owner of large tracts of timber land in the northern part of Pennsylvania. F. W. Dalrymple, of Bradford, Pa., is Chief Engineer.

Texas, Louisiana & Eastern.—James A. Smyth, Secretary of the road, and N. B. Putnam, President of the construction company, state that the grading would reach Cleveland, Tex., this week. Rails are delivered to complete the road from Conroe east to Cleveland as soon as the grading has been done. The work has been greatly retarded on account of wet weather, but the prospects for its early completion are now very fair.

Union Pacific, Denver & Gulf.—J. J. Davenport, of Denver, Col., has the contract for building the branch to the mines of the Allen Bond Coal Co., about four miles from Louisville, Ky., which is now under construction. Several other short branches to reach coal mines in Colorado, aggregating about 12 miles of road altogether, have been nearly completed. The lines are from Chappell to the Grey Creek mines, two miles; from Road Junction to Acme Junction, seven miles, and from Acme Junction to Acme mines, three miles.

Winnipeg & Hudson Bay.—A press dispatch from London states that the work of construction on this road will in all probability commence next spring, the contract having been signed by Messrs. Ross, Mann & Holt, of Montreal. Mr. Smith, a director of the company, is at present in England looking to the financial negotiations.

Yakima & Pacific Coast.—The grading on this road, the Northern Pacific branch to South Bend, Wash., has been completed, and it is expected that the first train will be run over the new line within a month. If the weather is favorable the work may be finished in a shorter time. Less than 10 miles of track is to be laid. The branch has been built from the Pacific Division at Chehalis west to the Pacific Coast at South Bend, Wash., and trains are running to Holcomb, or the west side of the Summit, about 45 miles from Chehalis.

Yankton, Norfolk & Southwestern.—The grading has been finished on the Missouri River opposite Yankton, S. D., to Norfolk, Neb., about 30 miles, and arrangements are now being made to continue the line south of that town. H. S. Morse of Chicago, Vice-President of the Macon, Dublin & Savannah road of Georgia is now interested in the construction of this road, and will make his headquarters at Yankton, S. D.

GENERAL RAILROAD NEWS.

Baltimore & Ohio.—The improvements which this company has under way at Cumberland, Md., are beginning to assume tangible shape. Ryan & McDonald, the contractors have excavated nearly 200,000 yards of earth, and a cut wide enough for four tracks, and nearly a mile in length, has been opened up. The work has been under way for many months and is not nearly completed. The yards proper, which will be the main feature of the improvement, will include about 40 acres, all of which has to be cut down from four to ten feet. About half the earth removed thus far has been used to fill up ravines and the remainder to raise the tracks from the new yards to a point 2½ miles below. The westbound track has received all the attention of the engineers thus far and has been temporarily abandoned, while it was being filled up. It is about at the desired grade now and is on an average, 8½ feet higher than before. The eastbound track will soon be abandoned and all traffic carried on over the westbound track, while the eastbound track is brought up to the same level. This raising of the tracks has necessitated the building of a new iron bridge over Evert's creek.

Boston & Maine.—The annual report for the year ending Sept. 30 makes an encouraging exhibit. The gross earnings from operation were \$16,076,852, an increase of \$894,190 over the previous year; total receipts, \$16,606,603, an increase of \$926,607 over the previous year; operating expenses, \$10,700,434, an increase of \$654,960; net income, \$5,906,169; surplus of net income over fixed charges, \$2,045,747; amount available for dividends, \$1,968,800; dividends paid, \$1,473,132; balance in excess of all charges and dividends, \$495,668. Of this amount \$425,000 was credited to the equipment fund. The road carried 33,689,684 passengers, an increase of 2,233,199; tons of freight carried were 7,442,125, an increase of 677,881. Miles of road operated, 1,210.

Canadian Pacific.—The line of the Canadian Pacific from Toronto east to Cavanville, Ont., has been laid with 70-lb. rails. The track from Cavanville to Peterborough, Ont., has been rebalasted and laid with new 60-lb. rails.

Cleveland, Lorain & Wheeling.—This road which has heretofore had its southern terminus at Bridgeport, Ohio, opposite Wheeling, W. Va., and which has transferred freight for Wheeling by boat and passengers by street railroad, has completed negotiations with the Wheeling Bridge & Terminal Co. and on last Monday began running all trains from that company's union station in Wheeling. Two through passenger trains for Cleveland, Toledo and Chicago leave Wheeling daily.

Green Bay, Winona & St. Paul.—The company has purchased property in Winona, Minn., and will build terminals thereon next season. It is announced that the Winona & Southwestern will use these terminals jointly with the Green Bay road, and that its shops will be located on this tract.

Hartwell.—The United States Court in Atlanta, Ga., this week appointed E. B. Benson receiver for the company. The road is a branch of the Richmond & Danville system from Bowersville, Ga., connecting with the Elberton Air Line at Hartwell, 10 miles.

Lehigh Valley.—The earnings for September as reported by the Philadelphia & Reading, the lessee, are as follows:

	1892.	1891.	Inc. or dec.
Gross earnings.....	\$1,580,945	\$1,611,148	D. \$30,203
Oper. expenses.....	1,093,672	1,136,611	D. 42,939
Net earnings.....	\$487,273	\$474,537	I. \$12,736

	Ten months ending Sept. 30, 1892.	1891.	Inc. or dec.
Gross earnings.....	\$14,946,648	\$13,769,308	I. \$1,177,340
Oper. expenses.....	11,159,164	10,913,120	I. 246,044
Net earnings.....	\$3,787,484	\$2,856,238	I. \$931,246

Macon & Atlantic.—J. R. Young, of Savannah, purchased the property of this company at the sale last week for \$410,000. The company is a partly constructed line between Macon, Ga., and Colleton, S. C., north of Savannah.

Marietta & North Georgia.—The announcement of the plan of reorganization states that after the purchase of the road, for the benefit of assenting bondholders, it is proposed to issue \$3,500,000 of five per cent. bonds, also \$4,000,000 second mortgage five per cent. and preferred stock of \$3,500,000, common stock to the amount of \$8,800,000. Of the first mortgage bonds, \$500,000 to be deposited for the extension of the road from Marietta to Atlanta and for providing proper terminal facilities. The rest of the first mortgage bonds to be issued for reorganization expenses.

Meriden, Waterbury & Connecticut River.—The stockholders at their annual meeting at Meriden, Conn., Nov. 23, ratified the lease of the road to the New York & New England system for 99 years. The vote was unanimous. The lease was ratified by the stockholders of the New York & New England at the special meeting last week.

Missouri, Kansas & Texas.—The Company reports for the first year under the present management, that ending June 30, gross earnings of \$9,750,536; operating expenses, \$7,063,604, and taxes, \$286,573, a total of \$7,350,177, leaving net earnings of \$2,390,359. This last item was applied as follows: Mortgage interest and rentals, \$2,250,836, leaving a balance of \$110,100. The adjustment of sundry accounts required \$31,226, leaving a net surplus of \$78,874. The average mileage operated was 1,674 miles; gross earnings per mile were \$5,824, net earnings per mile \$1,415, and the ratio of expenses to earnings, 75½ per cent. The expenses include \$1,154,571 extraordinary expenses, as follows: Ballasting 317 miles of road, \$295,000; bridges, 362 repaired or renewed, \$279,199; fencing, 745 miles, \$87,375, and renewals of rails, 220 miles, \$493,000. The report states that "no reasonable doubt exists that the regular payment of the February coupon may be confidently relied upon in every year." After Aug. 1, 1893, the interest on the second mortgage bonds becomes payable, and the officers are confident that by that time "the company will be in position to obtain a profit adequate to the discharge of all its obligations and with a resulting surplus in favor of its proprietors." The extension to St. Louis is approaching completion, as well as the continuation of the Southern line to tidewater connection at Houston. The report states that the policy of the company is to supply a continuous line of transportation of its own from the points where the traffic originates to the place of shipment at tidewater, or distribution by land through trunk line connections. This position will be attained early in 1893. The report gives full particulars of the position of the Land Grant legislation, of the subsidiary railroad companies and of the late reorganization.

New York, Lake Erie & Western.—The earnings of this system for the month of October, the first month of the new fiscal year, are given in the following table:

	1892.	1891.	Inc. or Dec.
Gross earnings.....	\$2,756,592	\$2,897,280	D. \$140,688
Operating expenses.....	1,745,378	1,817,739	D. 72,361
Due to leased lines.....	\$1,013,211	\$1,047,520	D. \$34,309
Net earnings.....	\$258,003	\$212,021	I. \$45,982

It has been decided by the directors not to pay any dividend on the preferred stock this term. The reason given is that the money to pay a dividend would have to be borrowed if one was declared, and it was thought wisest not to take that step.

Norfolk & Western.—This Company has taken time by the forelock at Kenova, W. Va., the point where it crosses the Ohio river and where the Huntington & Big Sandy road joins it. Instead of waiting for the town to grow and necessitate the building of a belt line around it, the Company has built the belt line already, and all factories and shops that have been secured by the Kenova Land Co. have been located on the belt line. This method insures that all industrial establishments shall have good shipping facilities and that the Norfolk & Western shall very largely control their freight. The Company has its new union station and office building at this point nearly completed. The cost of the building is \$50,000.

Pennsylvania.—The following is the statement for October of Eastern lines:

	1892.	1891.	Inc. or dec.
Gross earnings.....	\$6,390,883	\$6,108,100	I. \$282,783
Oper. expen.....	4,355,769	5,097,390	I. 741,621
Net earnings.....	\$2,035,114	\$1,010,710	I. \$1,024,404

Western lines show a gross increase of \$303,881 and a net increase of \$220,791, making a net loss for the system for the month of \$184,856.

Eastern lines for 10 months:

	1892.	1891.	Inc. or dec.
Gross earnings.....	\$56,889,631	\$55,935,278	I. \$954,353
Oper. expen.....	40,291,931	37,973,169	I. 2,318,762
Net earnings.....	\$16,597,700	\$17,962,109	D. \$1,364,409

Western lines show for 10 months a gross increase of \$2,874,494, and a net increase of \$18,574. The system for 10 months shows a gross increase of \$3,828,847 and a net decrease of \$1,339,575.

Philadelphia, Newton & New York.—The stockholders of the company at a special meeting on Nov. 28, voted in favor of an increase of the company's indebtedness to \$1,000,000, by issuing new bonds. The funds will be devoted to making the connection with the Philadelphia & Reading's tracks at Tabor Station, with a view to running into the Reading's new terminal at Twelfth and Market streets.

Philadelphia & Reading.—The report of earnings and expenses for the month of October and the fiscal year is as follows:

	1892.	1891.	Inc. or dec.
October:			
Gross earn.....	\$2,248,219	\$2,248,919	I. \$1,300
Oper. expenses.....	1,045,450	1,097,418	D. 1,762
Profit in operating....	\$1,152,569	\$1,149,501	I. \$3,068
Other receipts.....	76,839	76,741	I. 98
Profit for month.....	\$1,229,401	\$1,226,242	I. \$3,159
Exp. for perm. imp.....	\$13,568	\$39,308	D. 45,800
One-twelfth fixed ch'gs	625,000	611,763	I. 13,237
	\$638,568	\$671,139	D. \$32,570
Surplus.....	\$590,833	\$555,104	I. \$35,729
Fiscal year to Oct. 31:			
Gross earn.....	\$20,963,091	\$19,963,445	I. \$1,079,646
Oper. expenses.....	11,303,293	10,745,710	I. 557,583
Profit in operating....	\$9,679,795	\$9,157,735	I. \$522,060
Other receipts.....	513,547	429,114	I. 84,433
Profit for year.....	\$10,193,342	\$9,586,849	I. \$606,493
Exp. for perm. imp.....	\$112,703	\$493,955	D. \$381,252
One-twelfth fixed ch'gs	6,875,000	6,729,464	I. 145,536
	\$7,017,703	\$7,231,419	D. \$213,716
Surplus.....	\$3,175,637	\$2,355,429	I. \$820,208

Richmond & West Point Terminal.—Judge Bond, of the United States Court at Baltimore, has signed an order authorizing Mr. Walter G. Oakman, Receiver of this company, to institute proceedings to secure the cancellation of a contract by which the Terminal Co. purchased \$12,000,000 of the capital stock and \$3,553,000 of the collateral trust bonds of the Georgia Co., an investment company which had purchased control of the Central of Georgia. Mr. Oakman is also authorized to institute suits to recover money the Terminal Co. is alleged to have lost in the transaction. The stock and bonds in question have been deposited with the Central Trust Co. of New York as part security for the issue of \$11,500,000 five per cent. bonds by the Terminal Co. The petition alleges that the Terminal Co. paid over \$7,000,000 for the securities of the Georgia Co., but that at the time of the purchase they were worth only half that sum. It is also alleged that the purchase was made from a syndicate composed in large part of the directors and officers of the Terminal Co., at least three of its directors being interested in the syndicate.

San Antonio & Aransas Pass.—President Collis P. Huntington, of the Southern Pacific, returned to New York from his long stay on the Pacific slope last week. Mr. Huntington said that the purchase by the Southern Pacific of the San Antonio & Aransas Pass has not been completed owing to differences among the different classes of bondholders of the San Antonio road, but that negotiations were still pending.

South Carolina.—In the United States Circuit Court at Charleston, S. C., Nov. 23, Judge Simonton filed his decree ordering the road to be sold at the suit of Frederick W. Bond, Henry Thomas Cogan and other bondholders. Judge Simonton holds that the road must be sold as an entirety. Daniel H. Chamberlain, Receiver, has been appointed special master to make the sale at public auction at Charleston, on April 11 next.

Toronto, Hamilton & Buffalo.—Arrangements for the amalgamation of this road and the Brantford, Waterloo & Lake Erie are, it is reported, in progress. All local objections to the amalgamation have been removed and the Railway Committee of the Privy Council will be applied to for ratification of the arrangement.

Union Pacific.—The improvements proposed on the Idaho division includes the building of a stone culvert and taking out what is known as High Bridge, filling this place in with gravel. It is located on the Utah & Northern 243 miles north of Ogden, Utah. A 10 deg. curve is to be taken out on Glen Hill, 345 miles north of Ogden. The 17 deg. curve in Big Hole Canyon, 35 miles south of Butte, Mont., is to be reduced to a 12 deg. curve. The cost of the three pieces of work will be about \$16,000 or \$17,000.

Western Maryland.—President Hood has submitted his annual report to the Mayor and City Council, who will turn it over to the committee appointed to investigate the condition of the road. The gross earnings for the year are \$1,083,321, operating expenses, \$691,928, and net earnings, \$392,393. The increase of earnings as compared with 1891, is \$178,943, and the increase of expenses over 1891, is \$119,859, making the increase in net earnings over last year, \$59,084. The passenger mileage was 1,294,063 and freight mileage, 908,933 tons.

The report states that work upon the Baltimore & Harrisburg (eastern extension) on the new line between Porter's Junction and York, Penn., is making rapid progress.

TRAFFIC.

Traffic Notes.

The Louisville & Nashville has chartered a steamer to make regular trips between Pensacola and Havana.

The Merchants' Exchange, of Memphis, has decided to establish a freight bureau, and is trying to select a Commissioner.

The Trades' League, of Philadelphia, has passed a resolution favoring a law allowing railroads to pool their earnings, under the supervision of the Interstate Commerce Commission.

A carload of apples has been taken from New York to Denver in 10 days, by steamer to New Orleans and thence over the Southern Pacific, Houston & Texas Central and Union Pacific.

Officers of the Adams Express Company deny the report that another company is to take its place on the Louisville & Nashville. The contract of the Adams company does not expire for a long time yet.

The Iowa Railroad commissioners have ordered the Chicago, Milwaukee & St. Paul to put on an additional daily train to and from Waukon, Ia. This town is at the end of a short branch and has one train a day.

Another grain blockade is reported at the Mexican frontier, 600 cars having been accumulated at Laredo. It appears that the Mexican Government has issued an unexpected order stopping the free importation of grain on Nov. 30.

The Memphis Passenger Association is reported to have collapsed last week in consequence of an opera company being taken to Atlanta at half rates. This Association seems to go to pieces whenever the reporters in that city are short of news.

Commissioner E. B. Stabman, of the Southern Railway & Steamship Association tells a reporter that the most serious rate disturbances in the South have been those incident to cotton shipped to seaboard and other

Eastern points. He says that a few shippers have got control not only of the bulk of the cotton but of most of the compresses, and that the privilege of stopping off cotton to be compressed has been extended so recklessly, in the sharp competition between the roads, that cotton is carried 100 miles out of its way to reach a compress, the railroads receiving nothing for the extra transportation. Aside from this, competition has been so sharp that rates have in some cases been reduced more than 80 per cent.

In the United States District Court at Jacksonville, Fla., Nov. 30, Judge Swayne made an order sustaining the decision of the Interstate Commerce Commission in the orange rate suits. This order enjoins the Savannah Florida & Western Railroad and the Ocean Steamship Co. from charging higher freight rates on oranges to Eastern points than those allowed by the Commission to be just and reasonable. Prior to 1890 the rate had been 30 cents a box to New York. In November of that year the rate was raised to 40 cents. An appeal was taken to the Interstate Commission, which some months later rendered a decision ordering a rate of 35 cents to New York, and proportionately to other Eastern points. But the order was not obeyed, and by the present order a rebate of five cents a box is ordered to be paid on all shipments since November, 1890.

Chicago Traffic Matters.

CHICAGO, Nov. 30, 1892.

A mass meeting of all roads in central traffic territory is being held here to-day for the purpose of confirming and making effective the action of the presidents at New York, Nov. 17, in regard to freight and passenger rates.

The Chicago-St. Paul lines have agreed to an advance of 2½ cents in the proportional through rate on flour from Minneapolis to Chicago, making the basis 12½ cents, the same as the local rate between these points.

The Atchison has applied to Chairman Caldwell to have its business between Chicago and the Missouri River removed from the jurisdiction of the Western Passenger Association for a period of not less than six months, and the subject will be considered at the next regular meeting of the association, unless a request is made for a special meeting. The Atchison has for some time felt itself exceedingly hampered by its association obligations, the more that the Alton, not a member, has been enabled to make such rates as it pleased. The result has been that in many cases the Atchison has been unable to legally meet the rates made by its competitor in season to secure any business. The outcome of this request will be either a reorganization of the association under some plan which the Alton and Chicago Great Western will subscribe to or the withdrawal of the Atchison. The former is the more likely, as none of the roads care to be held responsible for the demoralization sure to ensue if the association goes to pieces.

The World's Fair management has not given up the attempt to secure the conviction of the scalpers under the Illinois law, notwithstanding the nolle prosequendo of the recent case. On Nov. 23 indictments were returned by the Grand Jury against six brokers in this city on evidence that they had bought and sold transportation without having credentials showing them to be duly authorized agents of the railroads. It is stated that the case will be pushed through to a decision as rapidly as the machinery of the courts will permit.

A report is current that the Gould lines are not in favor of Chairman Midgley's reorganization plan, nor even of Chairman Midgley, and that they will oppose any new association formed on present or past association lines. The commercial bodies of Kansas City are protesting strongly against the absorption of the territory of the defunct Trans-Missouri Association by the Western Freight Association. All in all, it looks as though the result of the meeting, which convened here to-day, to consider the report of the reorganization committee of the two associations, would be nil.

The Columbian Passenger Committee have adjourned "subject to the call of the chair," but not before Nov. 30, 1893, and the members will "go it alone."

The mass meeting of the general passenger agents last week was a complete success. Representatives of nearly 50 principal lines were in attendance, and took the opportunity to inspect the grounds and exchange views as to the best method for handling the business during the Fair. The consensus of opinion was in favor of a general reduction of about 20 per cent. from regular rates and the making of a much lower rate from points within 500 miles of Chicago on special days, and trains to accommodate such travel as cannot afford the higher rate. Representatives of the Pacific coast lines announced that they were in favor of a half rate from points on the coast and intermediate points as far east as the Missouri River. It was agreed that it was not expedient to make the reduced rates on limited trains.

The Gulf lines have weakened in the face of Chairman Midgley's ultimatum and have asked an extension of the time when the tariffs are to be withdrawn, pending negotiations, and the request has been granted and the time extended to Jan. 10.

Passenger rates to Ohio River territory continue to be reduced on account of the fight between the Monon and Pennsylvania. The latest reduction, by the latter company, is a rate of \$3.50 one way to Louisville, Cincinnati and intermediate points, and \$6 round trip. Prior to this reduction rates were cut by the Monon to \$7.50 round trip, \$4.25 first class one way and \$3.50 second class one way. The Pennsylvania seems determined to force the fight until rates shall have reached a point which will compel a restoration. It was reported from Louisville yesterday that the Louisville, Evansville & St. Louis Air Line had announced a \$1.50 rate to Chicago.

The lines operating between this city and Kansas City have voted that they will not accept less than \$12.50 as their proportion on through tickets from the East to Kansas City and Missouri River points via Chicago, and that if these tickets continue to be a demoralizing factor in the Chicago market that they will refuse to honor them. This action, which was initiated by the Alton, was taken after a full discussion, and all lines have agreed in the matter.

Judge Blodgett has issued an order in the United States Circuit Court vacating the judgments in contempt decreed against Charles Counselman and J. C. Peasley, Vice-President of the Chicago, Burlington & Quincy, for refusing to answer questions propounded by the Grand Jury last year. The judgments were fines of \$500 and commitment until paid.

The shipments of eastbound freight, not including live stock, from Chicago by all the lines for the week ending Nov. 25 amounted to 61,818 tons, against 71,324 tons during the preceding week, a decrease of 9,506 tons, and against 73,252 tons during the corresponding week of 1891. The proportions carried by each road were:

Roads.	W'k to Nov. 19.		W'k to Nov. 12.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	8,538	13.8	12,158	17.0
Wabash.....	2,417	3.9	3,386	4.7
Lake Shore & Michigan South.	12,218	19.8	13,890	19.4
Pitts., Ft. Wayne & Chicago....	6,463	10.5	8,574	12.0
Pitts., Cin., Chicago & St. Louis	8,060	13.1	8,726	12.2
Baltimore & Ohio.....	3,561	5.8	4,386	6.1
Chicago & Grand Trunk.....	4,942	7.5	5,426	7.6
New York, Chic. & St. Louis....	7,214	11.7	6,901	9.3
Chicago & Erie.....	6,707	10.9	5,713	8.1
C. C. & St. Louis.....	1,878	3.0	3,369	4.7
Total.....	61,818	100.0	71,324	100.0

Of the above shipments, 3,623 tons were flour, 25,864 tons grain and millstuff, 9,362 tons cured meats, 9,110 tons dressed beef, 2,215 tons hides and 7,425 tons lumber. The three Vanderbilt lines carried 45.2 per cent., the two Pennsylvania lines 23.6 per cent. The lake lines carried 77,253 tons, against 82,150 tons during the preceding week, a decrease of 4,897 tons.

Right to Run Express Trains in Kansas.

The Kansas Railroad Commissioners have decided, in the complaint of the citizens of Formosa, against the Chicago, Rock Island & Pacific that railroad companies have the right to operate through trains for the benefit of long distance passengers, and cannot be compelled to stop such trains at small stations. Numerous small towns have complained because the through trains from Kansas City to Denver do not accommodate them, and the complaint at issue involved all the points complained of. To the old settler who helped make laws requiring all trains to stop at every county seat, if not at his own "country seat," this must seem like dangerous and revolutionary progress. We tender him our sympathy.

Canadian Pacific Traffic.

A press dispatch from Ottawa gives a statement said to have been issued by the Canadian Pacific showing the volume of freight carried from United States ports over that road via British Columbia to China and Japan, and of freight carried between Eastern points in the United States and United States ports on the Pacific coast. The total is 37,254 tons during the year ending June 30 last, divided as follows:

	Tons.
Imported into the United States from China and Japan through British Columbia.....	11,619
Exported from the United States through British Columbia to China and Japan.....	12,034
From Eastern points of the United States to United States ports on the Pacific coast.....	6,956
From United States ports on the Pacific coast to Eastern points in the United States.....	6,645

The total quantity of tea imported into the United States from China via the Canadian Pacific was 5,000 tons, and of flour sent from the United States to China and Japan via the Canadian Pacific 9,000 tons. The total, it will be seen, is divided very nearly equally between Eastbound and Westbound. The average daily amount each way is 2½ cars, of 20 tons each.

The Interstate Commerce Commission.

The Commission on Tuesday announced the decision of the case of the Merchant's Union of Spokane Falls against the Northern Pacific and the Union Pacific. The points decided are briefly as follows:

1. Traffic by rail from Eastern points to the "Pacific coast terminals," Portland, Tacoma and Seattle is affected by the competition of water carriers, but such competition does not affect like transportation from said points to the city of Spokane. Held, therefore, that defendants are justified in maintaining higher rates on shipments from said points for the shorter distance to Spokane than for the longer distance to said Pacific terminals.

2. Held, that the only justification for a through rate less than an intermediate rate on the same article is the compulsion of rail carriers to accept the reduced compensation or suffer ocean rivals to perform the service, and where the pressure of this alternative is not felt there is no ground upon which the lower through charge can be excused.

3. In the matter of car load and mixed car load rates, defendants are required to allow the same privileges on shipments to Spokane as are provided or allowed on like shipments to Portland or other Pacific coast terminals.

4. "Blanket" class rates upon the Northern Pacific road for a distance of over 300 miles are held unreasonable; defendants ordered to desist from charging rates on property from Eastern points to Spokane, which materially exceed the two per cent. of class rates now in effect both to Spokane and Pacific coast terminals.

5. The Northern Pacific, notwithstanding certain provisions in its charter, is subject, like all other interstate carriers, to the authority conferred by Congress in the act to regulate commerce.

Coal Rates on the Louisville & Nashville.

The Commission, in an opinion by Commissioner McDill, has announced its decision in the matter of alleged unlawful charges for the transportation of coal by the Louisville & Nashville. Upon investigation instituted by the commission on its own motion it appears that the respondent had in force, over its line to Nashville, a special rate on coal when used for manufacturing purposes by persons named upon the manufacturers' list prepared by the railroad company. Pending investigation, the respondent discontinued the "manufacturers' rate" and put in force a new coal tariff to Nashville, whereby on coal, "run of mines, nut and slack" is given a rate of \$1 a ton the year round, and "screened" coal a rate of \$1.15 a ton, April to September, and for the remainder of the year a rate of \$1.40 a ton. The rate from the same mines to Memphis, a point affected by water competition for coal traffic, is \$1.40 a ton on all coal the year round, and respondent buys coal at the mines and sells it in the Memphis market. It is held, first, that the practice abandoned by the respondent common carrier of arbitrarily determining what persons should receive the so-called "manufacturers' rate" was a clear violation of the act to regulate commerce. Second.—That the rate of \$1 a ton charged by respondent upon coal, "run of mines, nut and slack" is not unreasonably low, nor disproportionate to the rate of \$1.40 to Memphis; neither, in view of circumstances affecting coal traffic at Memphis, is a rate of \$1.15 on screened coal to Nashville relatively unreasonable as compared with the Memphis rate; but so long as the Memphis rate does not exceed \$1.40, rates on these kinds of coal from the mines to Nashville should not, during any portion of the year, exceed \$1 or \$1.15, respectively, and any reduction in the Memphis rate should be accompanied by proportionate reductions in rates on the different kinds of coal to Nashville.

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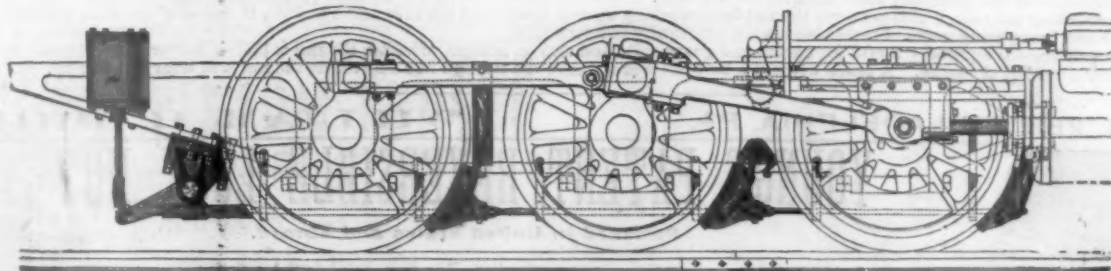
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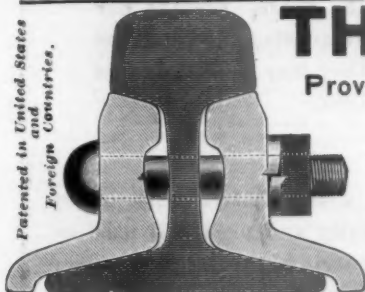
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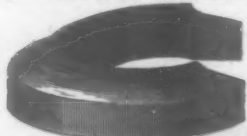


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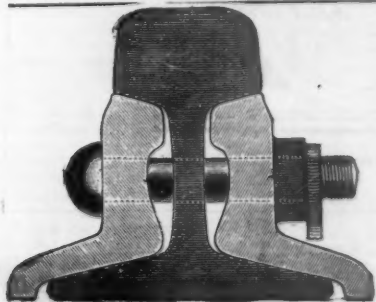
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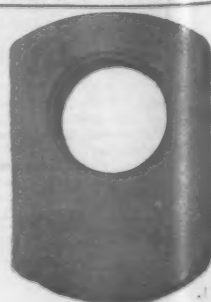
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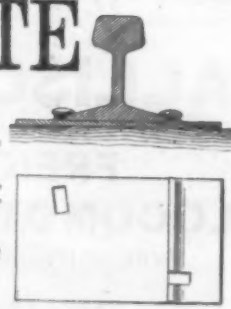
The rail bearing against the shoulder brings into use the inside as well as the outside of spike, doubles the present resistance to lateral thrust and thus effectually prevents spreading of the track. Especially adapted for use in Yards, at Terminals, and on Curves and Bridges.

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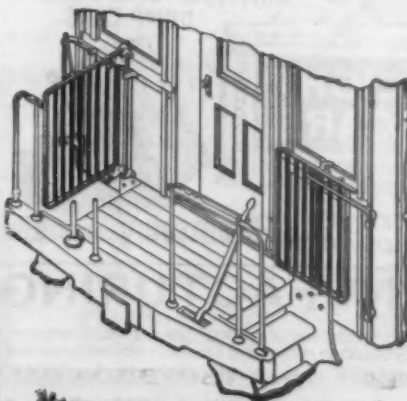
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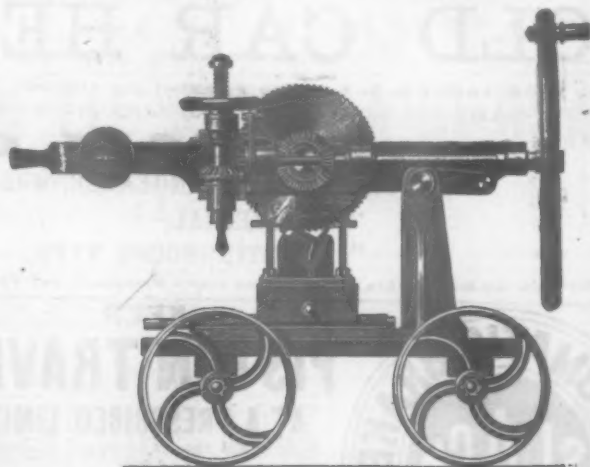


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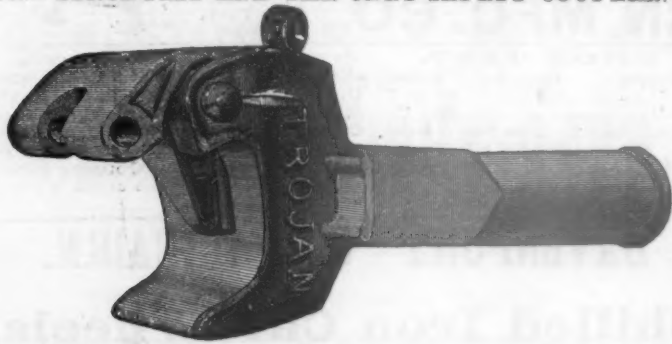
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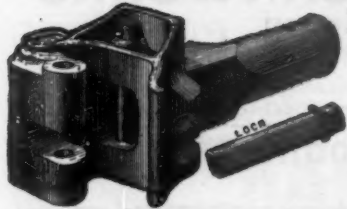


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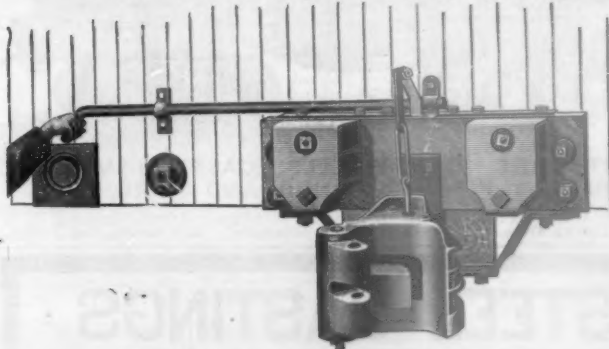
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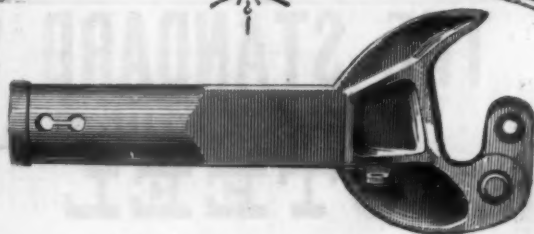
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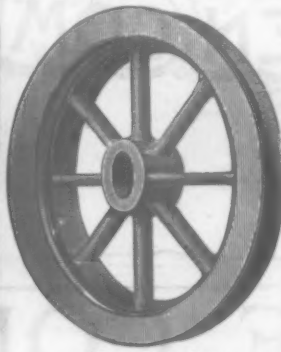
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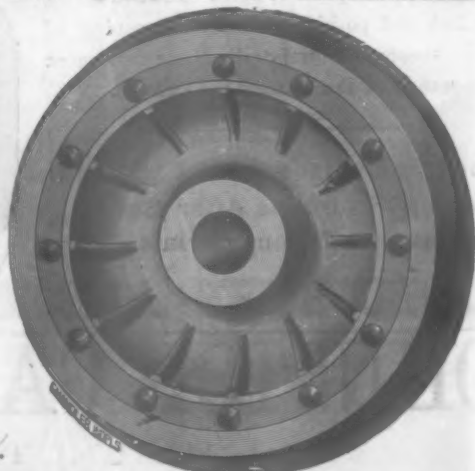
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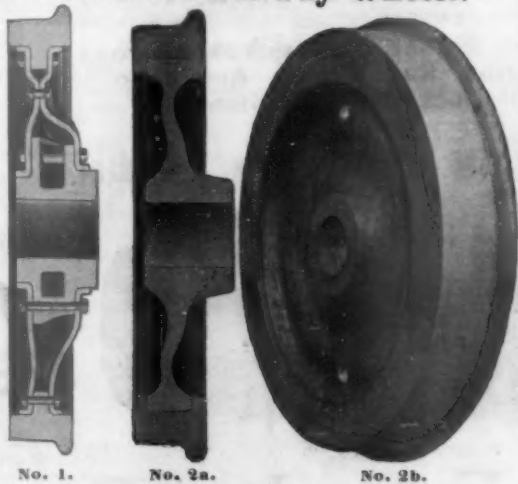
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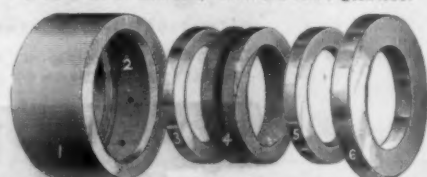
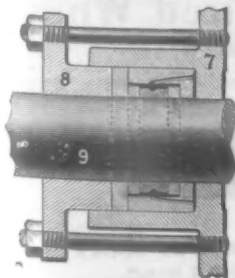
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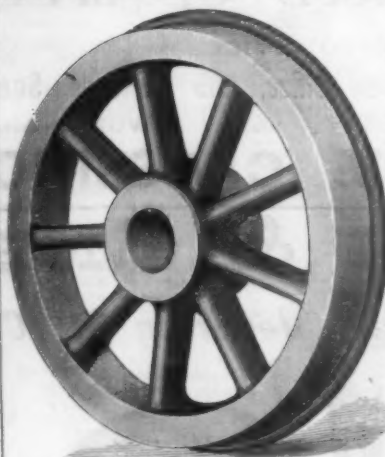
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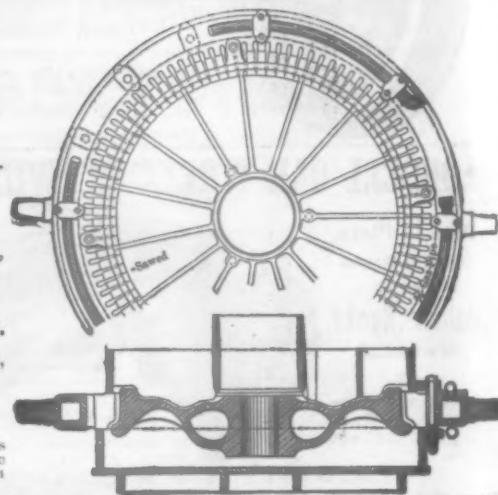
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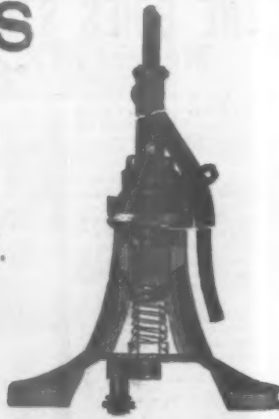
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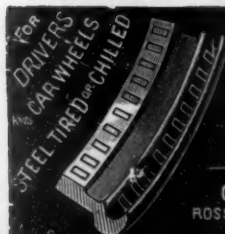
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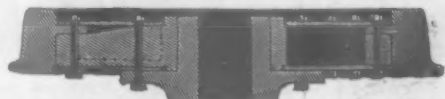
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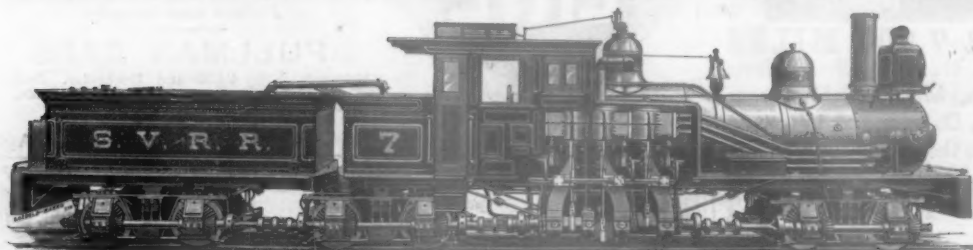


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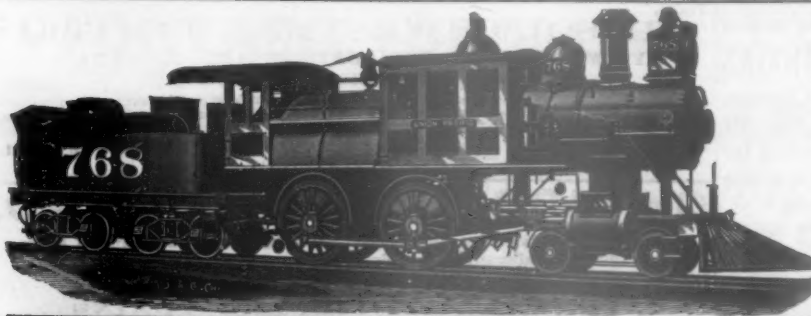


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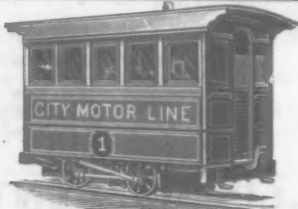
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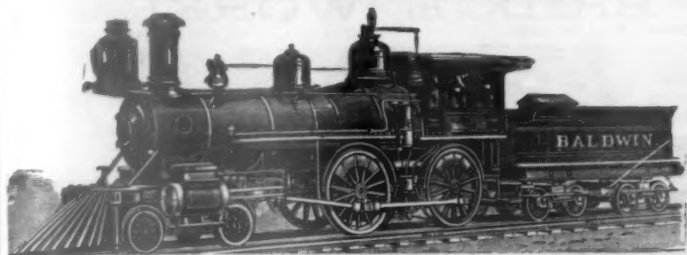
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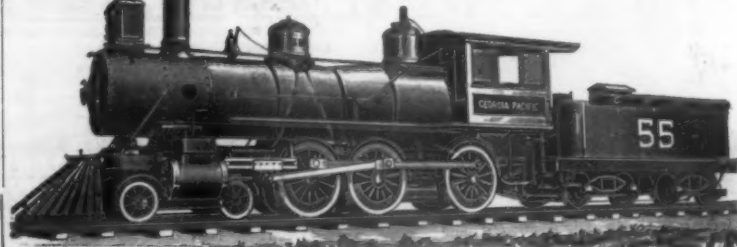
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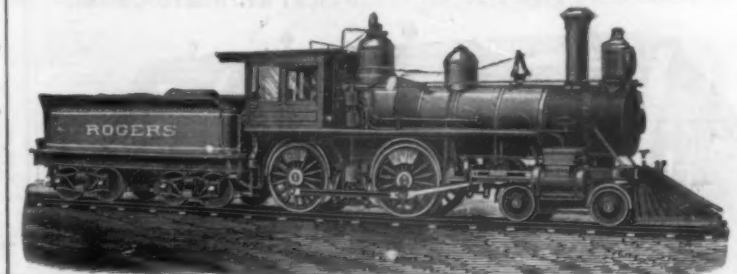
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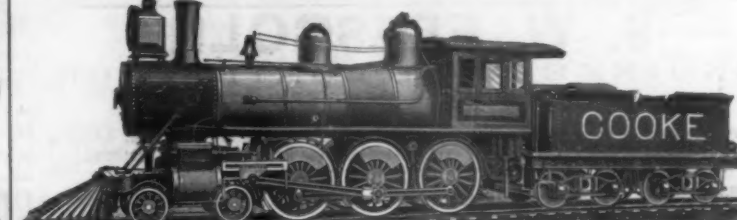
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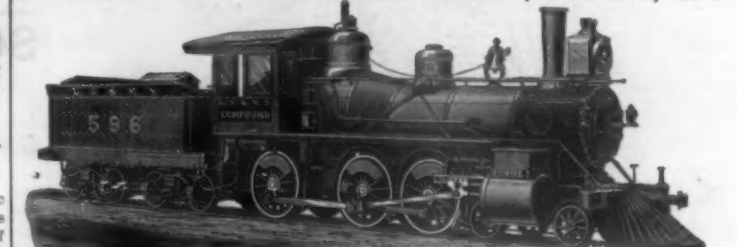
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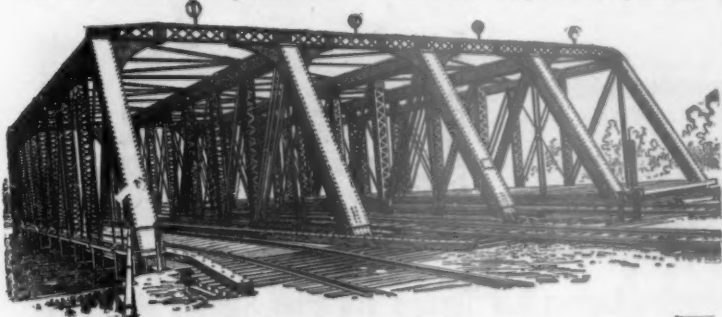


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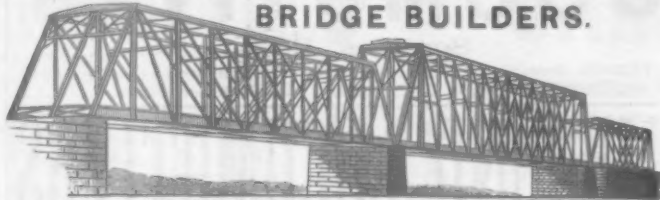
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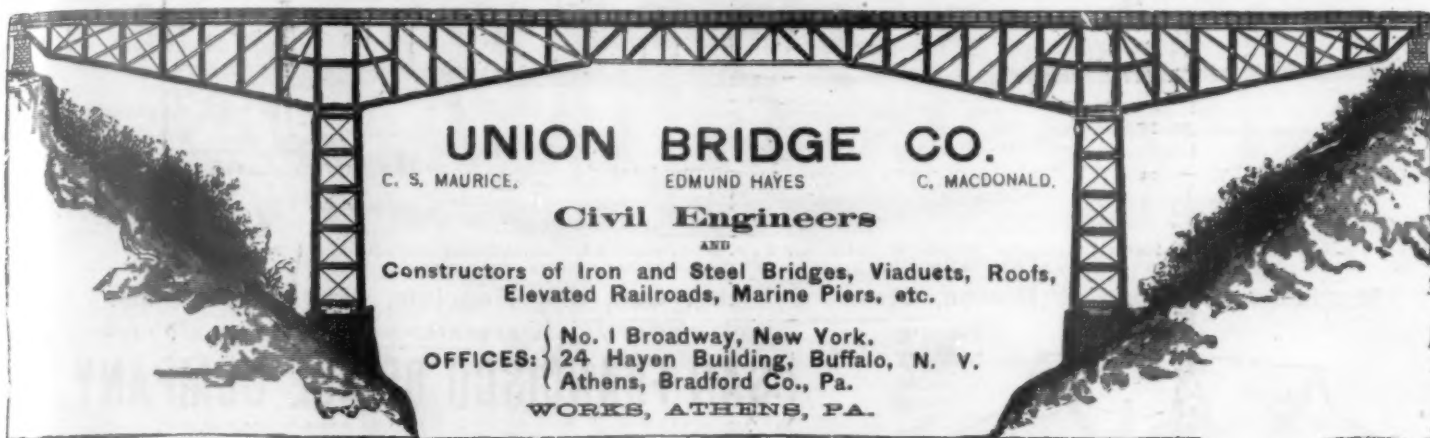
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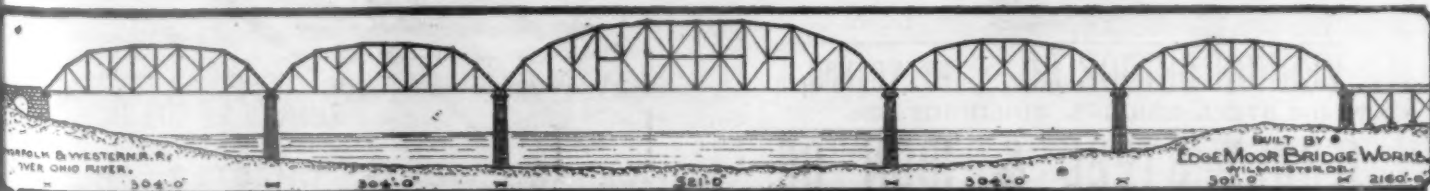
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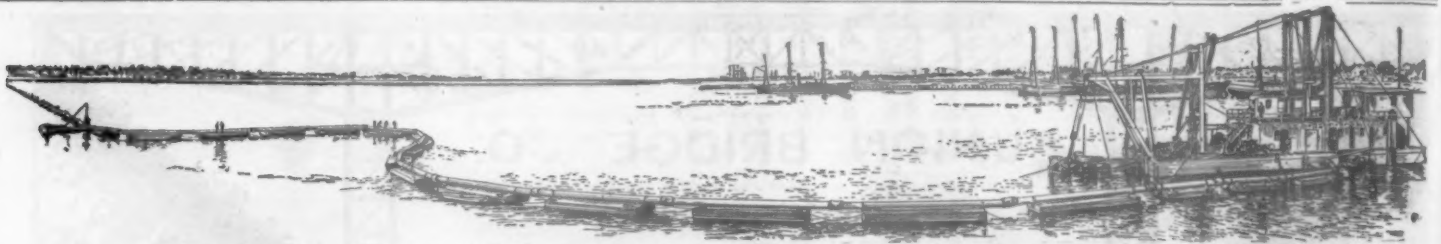


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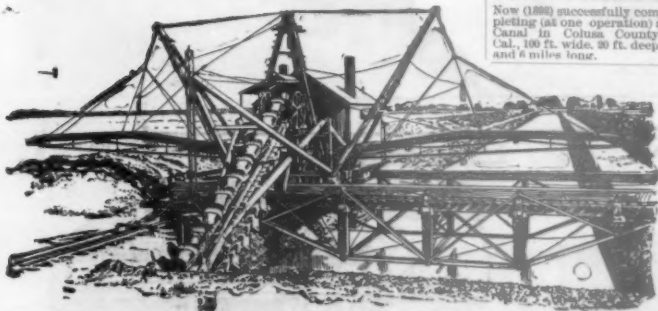
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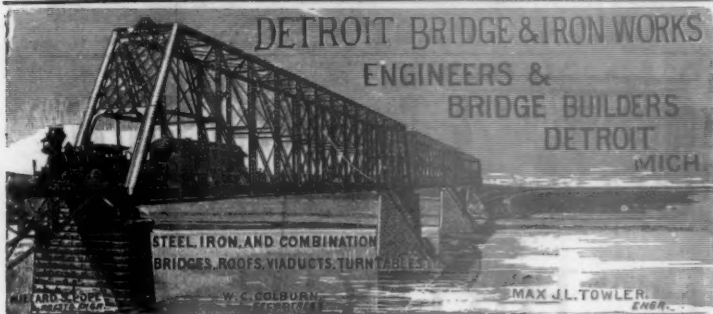
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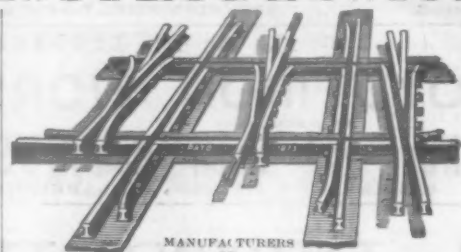
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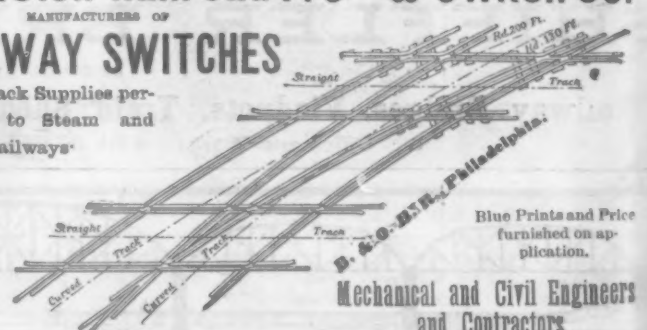
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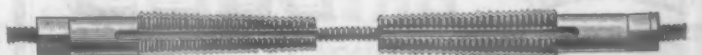


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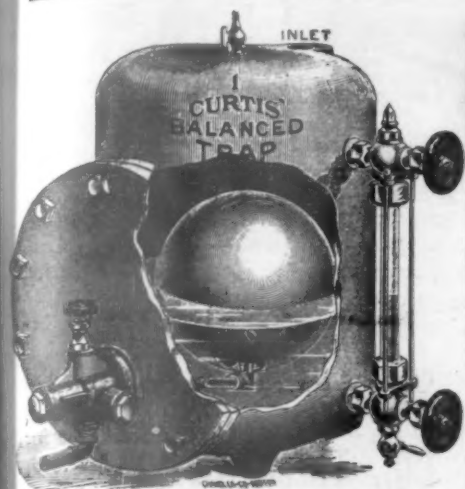
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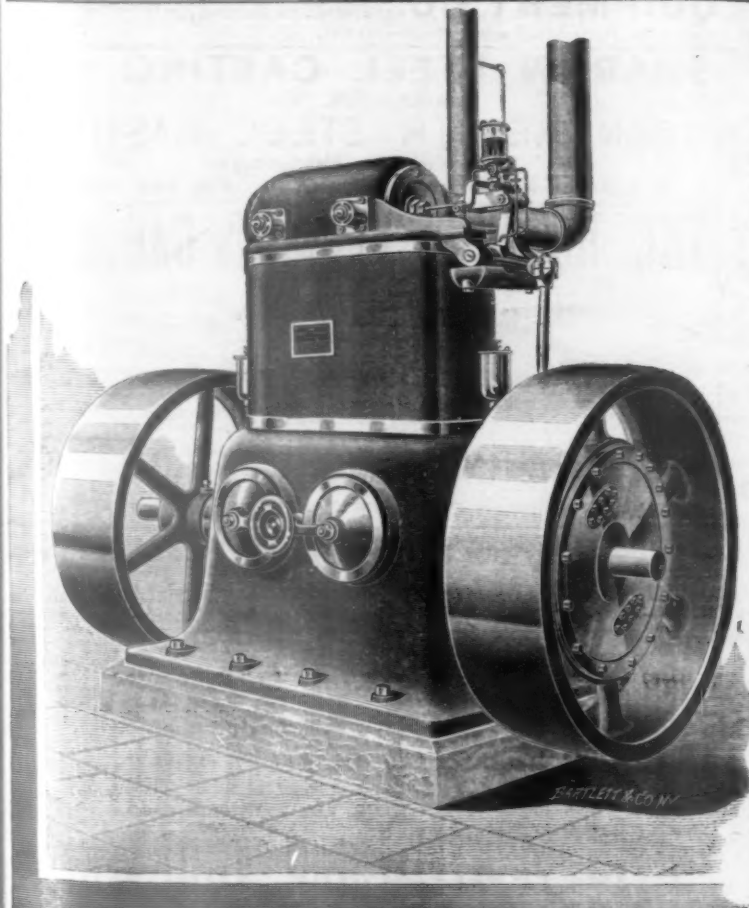
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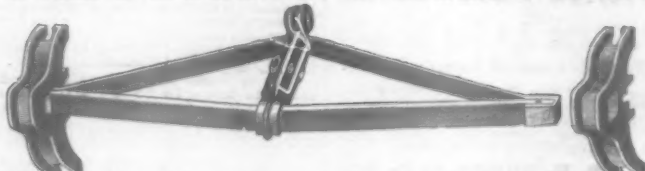
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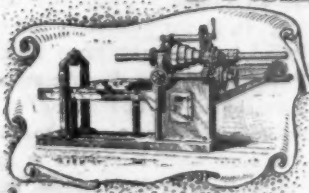
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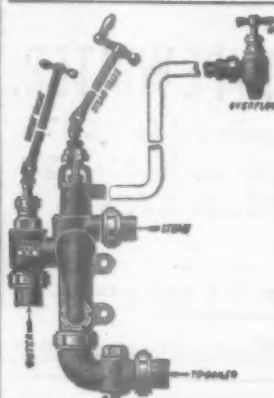
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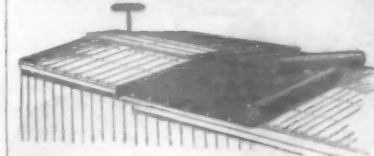
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